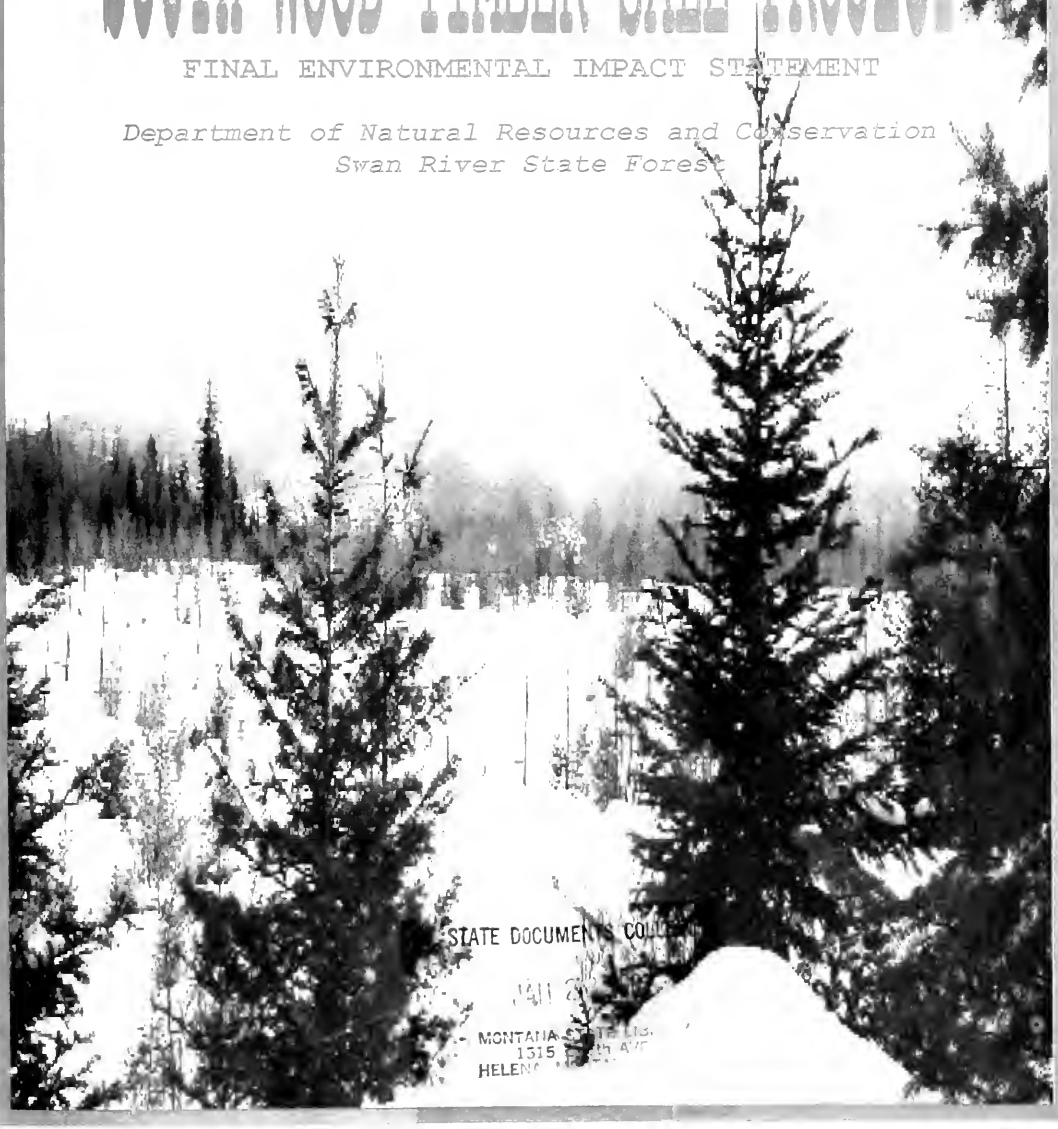
AUGUST 2001

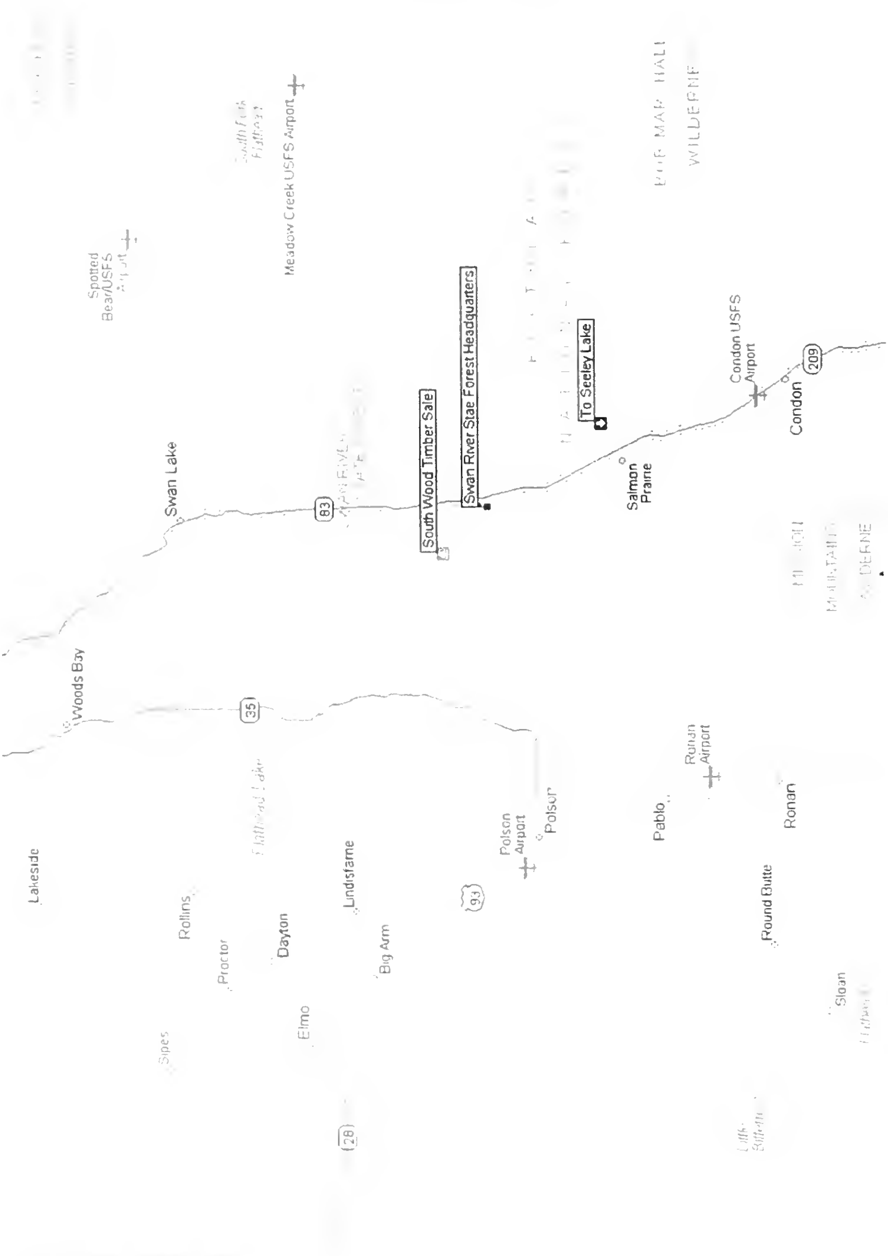
SOUTH WOOD TIMBER SALE PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

Department of Natural Resources and Conservation
Swan River State Forest



VICINITY MAP



DEPARTMENT OF
NATURAL RESOURCES AND CONSERVATION

JUDY MARTZ, GOVERNOR

STATE OF MONTANA

NORTHWESTERN LAND OFFICE
2250 HIGHWAY 93 NORTH
KALISPELL, MONTANA 59901-2557

Telephone: (406) 751-2240
FAX: (406) 751-2288

SOUTH WOOD TIMBER SALE PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

August 13, 2001

Enclosed is a copy of the South Wood Timber Sale Project FEIS.

The proposed project is located approximately 13 miles southwest of Swan Lake, Montana in Swan River State Forest.

I have chosen Action Alternative F as the proposed decision. Action Alternative F is a new alternative that represents a modification of Action Alternative C, which was analyzed in the DEIS. The primary modification is that Action Alternative F does not harvest in old-growth stands. I anticipate issuing a Decision Notice or a separate Record of Decision fifteen calendar days after publication of the FEIS.

DNRC has made the necessary adjustments in the FEIS to reflect the most current old-growth situation.

The FEIS is written in a different format than previous Swan River State Forest FEIS publications. The Summary incorporates pictures to convey information and is written so that a person at any interest level is able to understand the contents. The FEIS consolidates Chapters III and IV into Chapter III, which summarizes the analysis in plain English. The bulk of the scientific analysis is located in the tabbed Appendices. I hope this format change improves our ability to communicate with all individuals interested in the management of State lands. I welcome your thoughts and comments.

Sincerely,

Robert L Sandman
Unit Manager
Stillwater/Swan State Forests
58741 Highway 83 South
Swan Lake MT 59911
(406) 754-2301

RLS:wh/mb
Enclosure
cc: South Wood TS

ENVIRONMENTAL IMPACT STATEMENT

PREFACE

SOUTH WOOD TIMBER SALE PROJECT

ENVIRONMENTAL IMPACT STATEMENT PREFACE

The South Wood Timber Sale Project Final Environmental Impact Statement (FEIS) format is probably different than other Environmental Impact Statement (EIS) documents you have read. This preface explains why this FEIS is unique and how to use it. The key reasons for this format change are:

- We want to present an easily read document that will allow interested parties to understand the major effects and conclusions of the analyses without the extensive, complex scientific details.
- We also want to present a document that includes the necessary scientific detail and is legally sound.

To accomplish these goals, the FEIS is split into 3 separate, but related, parts:

EXECUTIVE SUMMARY

This portion summarizes the FEIS by briefly describing:

- the proposed action,
- the issues connected with each analysis,
- the alternatives that were considered, and
- the environmental effects of each alternative.

The written information has supporting photographs and maps to make it easily understood.

FEIS

Chapter I describes the purpose and need of the proposed action and the issues that guided our alternative development and environmental-effects analysis.

Chapter II describes the alternatives that were analyzed and compares their effects.

Chapter III displays the existing environment and the environmental effects to each resource for each alternative. The effects analysis is summarized and condensed so the proposal and its effects can be easily understood. Individuals wanting a more detailed explanation should refer to the *RESOURCE APPENDICES.*

RESOURCE APPENDICES

The Resource Appendices contain the full technical and scientific discussions of:

- the analysis methods and areas,
- the existing conditions,
- and the direct, indirect, and cumulative effects of the proposed actions on the environment.

The discussions include citations and data from research documents, environmental assessments, and database analyses. Each Interdisciplinary Team member (ID Team) prepared the analysis for his individual specialty (water, soil, vegetation, etc.). The appendices provide the basis for the information and conclusions that are displayed in the FEIS and Executive Summary. The analyses are summarized in the FEIS; therefore, the information in the appendices need to be utilized for scientific, technical, or legal reviews.

ACRONYMS

SOUTH WOOD TIMBER SALE PROJECT

ACRONYMS

ARM	Administrative Rules of Montana
BMP	Best Management Practices
dbh	Diameter at Breast Height
DEQ	Department of Environmental Quality
DFWP	Montana Department of Fish, Wildlife and Parks
DEIS	Draft Environmental Impact Statement
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
EAC	Environmental Assessment Checklist
ECA	Equivalent Clearcut Acres
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FI	Forest Improvement
FNF	Flathead National Forest
FY	Fiscal Year (July 1-June 30)
GNP	
ID Team	Interdisciplinary Team
FOGI	Full Old-Growth Index
LAU	Lynx Analysis Unit
LWD	Large Woody Debris
MBF	thousand board feet
MBTSG	Montana Bull Trout Scientific Group
MCA	Montana Codes Annotated
MEPA	Montana Environmental Policy Act
MAPA	Montana Administrative Procedures Act
MMBF	Million Board Feet
NCDE	Northern Continental Divide Ecosystem
NWLO	Northwestern Land Office
SB	Senate Bill
SFLMP	State Forest Land Management Plan
SLI	Stand-level Inventory
SMZ	Streamside Management Zone
SVGBCA	Swan Valley Grizzly Bear Conservation Agreement
TMDL	Total Maximum Daily Load
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WYI	Water Yield Increase

124 Permit	Stream Preservation Act Permit
318 Authorization	A Short-term Exemption from Montana's Surface Water Quality Standards
Cooperative Program	Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program
Land Board	Board of Land Commissioners
Recovery Team	Montana Bull Trout Recovery Team

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER I

PURPOSE AND NEED

SOUTH WOOD TIMBER SALE PROJECT

CHAPTER I
PURPOSE AND NEED

INTRODUCTION TO THE PROPOSED ACTION

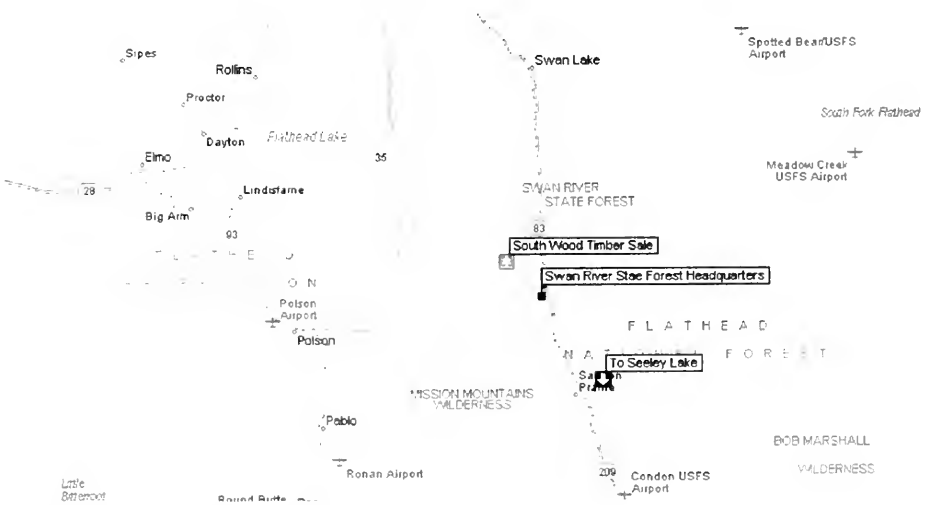
Swan River State Forest, Montana Department of Natural Resources and Conservation (DNRC), proposes the South Wood Timber Sale Project. The primary activities include:

- timber harvesting,
- new road construction,
- road drainage improvements, and
- road safety improvements.

If a harvest alternative were selected, 4.5 to 6 million board feet (MMBF) of timber would be harvested from 300 to 670 acres, and approximately 0.5 to 5.4 miles of new road would be constructed, depending on the alternative selected. An old bridge would be removed from Woodward Creek and many roads within the project area would be improved to meet Montana Best Management Practice (BMPs) Standards for Forestry.

The project area is located approximately 10 miles southwest of Swan Lake, Montana, within Sections 2, 10, 12, 14, 16, 22, 23, 24, 26, 28, 30, 32, and 36, Township 23 north (T23N), Range 18 west (R18W). (see *FIGURE I-1, SOUTH WOOD TIMBER SALE VICINITY MAP*).

FIGURE I-1—SOUTH WOOD TIMBER SALE VICINITY MAP



PURPOSE

The lands involved in the proposed project are held by the State of Montana in trust for the support of specific beneficiary institutions. These include public schools, State colleges and universities, and other specific State institutions, such as the School for the Deaf and Blind *(Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11)*. The Board of Land Commissioners (Land Board) and DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for these beneficiary institutions, *Section 77--1-202, Montana Codes Annotated (MCA)*. On May 30, 1996, DNRC released the Record of Decision for the State Forest Land Management Plan (SFLMP). The Land Board approved the SFLMP's implementation on June 17, 1996. The SFLMP outlines the management philosophy of DNRC in the management of State forested trust lands and sets out specific Resource Management Standards for 10 resource categories.

The Department will manage the lands involved according to the philosophy and standards in the SFLMP, which states:

> *Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue stream... In the foreseeable future, timber management will continue to be our primary source of revenue and our primary tool for achieving biodiversity objectives.*

PROPOSED OBJECTIVES

In order to meet the goals of the management philosophy adopted through a programmatic review of the SFLMP, DNRC has set the following specific project objectives:

- Generate revenue for the school trust while promoting biodiversity on State ownership. Biodiversity would be promoted by managing for appropriate stand structures and compositions based on ecological characteristics (land type, habitat type, disturbance regime, unique characteristics). For threatened, endangered, and sensitive species, a fine-filtered approach would be used that focuses on the habitat requirements of single species.
- Provide 4 to 6 MMBF of the Northwestern Land Office (NWLO), DNRC, volume contribution to the annual timber harvest on State trust lands that is required by State law (*77-5-221 through 223, MCA*).
- Provide funding for streamside rehabilitation projects at culvert crossings and old bridge sites to reduce the likelihood of sediment delivery to streams.
- Complete site improvements on existing roads to improve drainage, water quality, and safety, as recommended by current BMPs.

RELATIONSHIP TO THE SFLMP

The SFLMP is a programmatic plan that provides field personnel with consistent policy, direction, and guidance for the management of State forested lands. It contains the general philosophies and management standards that will provide the framework for project-level decisions.

The planning of the proposed South Wood Timber Sale Project was guided by the SFLMP. The SFLMP philosophy and its appropriate Resource Management Standards have been incorporated into the design of the proposed actions. The South Wood Timber Sale Project EIS is not intended as a programmatic or area

plan and is limited to addressing specific proposed actions in reference to issues that were identified through public involvement and ID Team input.

EIS PROCESS

EIS DEVELOPMENT

This EIS was prepared in compliance with Montana Environmental Policy Act (MEPA), which requires State government to include consideration of environmental impact in its decisionmaking process. It also requires agencies to inform the public and other interested parties about proposed projects, the environmental impacts that may result, and alternative actions that could achieve project objectives.

PUBLIC SCOPING

The initial stage of an EIS is the pubic scoping process, which is used to inform the public that a State agency is proposing an action and receive comments or concerns about the possible impacts of the project.

In February 2000, DNRC initiated public participation in the South Wood Timber Sale Project proposal by placing an advertisement in Kalispell's Daily Inter Lake and the weekly Bigfork Eagle newspapers. In addition, a letter, which included maps and general information about the project, was mailed to individuals, agencies, industry representatives, and other organizations that had expressed interest in Swan River State Forest's management activities. The mailing list for the initial proposal for this project can be found in *APPENDIX L—INITIAL SCOPING MAILING LIST*.

The public comment period for the initial project proposal was open for 30 days. The ID Team, made up of DNRC resource specialists (see *LIST OF PREPARERS AND CONTRIBUTORS* at the end of *CHAPTER III*), summarized issues and concerns identified through the public scoping. The ID Team, after reviewing the issues and concerns, found that the projected needed to be further refined. In August 2000, an additional letter that detailed those refinements was sent to all interested parties.

By October 2000, the ID Team defined the action alternatives, complete with maps of the potential harvest areas and their respective silvicultural treatments. A newsletter was published in October that described both the concerns identified through the scoping process and the action alternatives that were being developed by the ID Team. A 20-day comment period followed. The mailing list for the newsletter is in the project file. In July 2001, a public field tour was given in the South Wood Timber Sale Project area. A list of those attending the tour is in the project file at the unit office.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

In April 2001, a DEIS was prepared. Public comments related to issues that could affect the project were incorporated into the document. Upon publication, notification that the DEIS was available was sent to individuals on the mailing list. The DEIS and/or an Executive Summary of the DEIS and Appendices was circulated to the individuals requesting the documents. Comments pertaining to the DEIS were accepted for 30 days. Responses to those comments are included in *APPENDIX M—COMMENTS AND RESPONSES*.

FEIS

After public comments were received, compiled, and addressed, DNRC prepared an FEIS. This FEIS consists, primarily, of a revision

of the DEIS that incorporates new information, based on public and internal comments. A proposed decision prepared by Robert L. Sandman, Unit Manager of the Stillwater and Swan Units, is included in Chapter II.

NOTIFICATION OF DECISION

Following publication of the FEIS, the Swan River State Forest Unit Manager will review public comments, the FEIS, and information contained in the project file. No sooner than 15 days after publication of the FEIS, the Unit Manager will consider and determine the following:

- Do the alternatives presented in the FEIS meet the project's purpose?
- Are the proposed mitigation measures adequate and feasible?
- Which alternative or combination/ modification of alternatives should be implemented? Why?

These determinations will be published and all interested parties will be notified. The decisions presented in that published document would become DNRC's recommendation to the Land Board. Ultimately, the Land Board would make the final decisions regarding the actions to be implemented.

PROPOSED SCHEDULE OF ACTIVITIES

After a decision is published, if a timber-harvesting alternative is selected, a Timber Sale Contract package would be prepared in the fall of 2001.

This contract package is tentatively scheduled for presentation to the Land Board in October 2001. If the Land Board approves the timber sale, the sale may be advertised in the fall. Harvesting and roadwork activities would occur for approximately 2 years after the sale is sold. Postharvesting activities, such as site preparation, planting, and hazard reduction, would occur following harvesting activities.

OTHER ENVIRONMENTAL REVIEWS RELATED TO THE PROJECT

In order to address the direct, indirect, and cumulative effects to resources on a landscape level, resource analyses will consider potential effects from past, present, and future actions within a defined analysis area. A list of other ongoing projects and/or timber sales can be found in *APPENDIX A - LIST OF RELATED ENVIRONMENTAL REVIEWS*.

OTHER AGENCIES WITH JURISDICTION/ PERMIT REQUIREMENTS

Montana Department of Fish, Wildlife, and Parks (DFWP) has jurisdiction over the management of fisheries and wildlife in the project area. DFWP is on the mailing list and has received the initial proposal and newsletters.

DNRC has an ongoing contract with DFWP to collect data and monitor streams for the conditions of fisheries habitat and the presence/ absence of bull trout and westslope cutthroat trout on Swan River State Forest.

PERMITS THAT MAY BE REQUIRED TO IMPLEMENT THE PROPOSED ACTIONS

- A Stream Preservation Act Permit (124 Permit) is required from DFWP for activities that may affect the natural shape and form of a stream or its banks or tributaries.
- A Short-term Exemption from Montana's Surface Water Quality Standards (318 Authorization), issued by the Montana Department of Environmental Quality (DEQ), may be required if:

- temporary activities would introduce sediment above natural levels into streams, or

- DFWP feels a permit is necessary after reviewing the mitigation measure in the 124 Permit.

DNRC is a member of the Montana Airshed Group, which regulates slash burning that is done by DNRC. DNRC receives an air-quality permit through participation in the Montana Airshed Group.

PUBLIC CONCERNS

Through the public involvement process, resource specialists of DNRC and other agencies and the public raised concerns about the project's potential impacts on the environment. DNRC used these concerns in developing the project design, mitigation measures, and alternatives *(CHAPTER II)*. A summary of the comments incorporated into the alternatives is presented below.

CULTURAL RESOURCES

Logging and road building may adversely impact cultural resources.

ECONOMICS

- Long-term reforestation costs and other lost-opportunity costs (wildlife habitats, recreation, etc.) may exceed revenue generated by timber harvesting.

- DNRC may not continue to provide small salvage permits within the South Wood Timber Sale Project area, thereby excluding opportunities for the small operator.

- Sustainable, commercial timber harvesting in Swan River State Forest should provide a reasonable rate of return to the trust.

- At times, DNRC does not consider an alternative that produces optimum revenue while using the minimum requirements within State and Federal laws and the SFLMP.

- By not harvesting within old-growth forests, revenue to the school trust may not be optimized.

- Not harvesting enough timber in a timely manner may contribute to higher logging costs and lower returns to the school trust.

FISHERIES/WATER QUALITY

- Road construction and timber harvesting may reduce water quality and have detrimental effects on fisheries habitat by increasing sedimentation and changing water temperatures.

- BMPs and road improvements may not occur without the revenue generated by the South Wood Timber Sale Project.

- Cumulative harvesting may increase water yield within the South Woodward and Woodward drainages, increasing the risk of impacts to beneficial water uses and watershed values.

- Buffers along streams need to be wide enough to protect water quality and fish habitat.

VEGETATION

- The cumulative effects of logging and roads have altered the landscape from what was historically in the Swan Valley.

- DNRC is logging lands that are unsuitable for timber harvesting because of biological reasons.

- DNRC's silvicultural treatments may not adequately maintain the appropriate stand composition, density, and structure that were there historically, which may contribute to the poor health and vigor of the timber stands.

- Not harvesting within old-growth stands may not be good for the long-term health of these stand.

- New road construction to access areas in need of management may not take place without the South Wood Timber Sale Project.

SOILS

Timber harvesting may cause soil displacement, erosion, and compaction, which would reduce soil productivity.

WILDLIFE

- Harvesting within old-growth or other mature stands may reduce the quality and amount of old growth, which would cause the loss of old-growth habitat. This loss would be impossible to recover and could contribute to the extinction of old-growth-dependent species.

- Timber harvesting may affect the habitat of Canada lynx. Harvesting in old growth may reduce their denning habitat. Over time, regeneration harvests may reduce connectivity and increase forage habitat.

- Timber harvesting and associated activities may disrupt grizzly bears and/or alter their habitat.

- Harvesting in old-growth or mature timber types above 5,000 feet elevation may reduce boreal owl habitat.

- Harvesting along perennial streams and in some uplands may reduce fisher habitat by reducing structure and/or canopy cover and interrupting travel corridors.

- Timber harvesting may remove or reduce the structure needed for pileated woodpeckers now and in the future.

- Timber harvesting may increase fragmentation and sever forested movement corridors.

- Increased road building may increase disturbance to wildlife, resulting in reduced available habitat and increased stress, which may reduce reproduction and the survival of wildlife species.

CHAPTER II

ALTERNATIVES

SOUTH WOOD TIMBER SALE PROJECT

CHAPTER II
ALTERNATIVES

INTRODUCTION

The purpose of Chapter II is to introduce 5 action alternatives for the South Wood Timber Sale Project area. The effects of implementing each alternative, including the No-Action Alternative, will be summarized. This chapter will first focus on the development of the action alternatives and summarize the description of each alternative. The probable environmental consequences associated with each alternative will then be briefly outlined. *TABLE II-2–SUMMARY OF ENVIRONMENTAL EFFECTS* summarizes the effects of the detailed environmental analyses in Chapter III and Appendices C through K.

DEVELOPMENT OF ALTERNATIVES

An ID Team was formed in the spring of 2000 to work on the South Wood Timber Sale Project. The role of the ID Team is to summarize issues and concerns, develop management options for each alternative within a project area, and analyze the potential impacts of a proposal on the human and natural environments.

During the summer/fall of 2000, ID Team members and other DNRC personnel were involved in a thorough field inspection of the project area. Information pertaining to the resources in the project area was collected. The collected information aided in analyzing wildlife habitat, water quality, timber harvesting, road standards, and economics, and developing ways to lessen or eliminate impacts to resources (mitigation measures) that could be applied to the proposal. The ID Team developed 4 action proposals within the framework of the SFLMP and its associated Resource Management Standards. Public comments were also taken into consideration.

On February 21, 2001, DNRC was required by a court ruling to undertake administrative rule making under the Montana Administrative Procedures Act (MAPA) for its existing Biodiversity Guidance. Within the Biodiversity Guidance is DNRC's strategy for managing old-growth forests. As part of the court ruling, DNRC was enjoined from harvesting within old-growth forests until it could comply with the procedural rule-making requirement of MAPA for its Biodiversity Guidance.

Additionally, DNRC has changed how it defines old-growth forests and has formally adopted the old-growth definitions proposed by *Green et al (1992)*. Senate Bill 354, which is a new law, requires the trust to be monetarily compensated for any temporary or permanent deferrals of State forestland for natural areas, open space, old-growth preservation, and wildlife management areas.

These factors are lending uncertainty as to how to approach old-growth management with this project and direction from the decisionmaker has prompted the ID Team to develop a fifth action alternative that minimizes harvesting in old growth.

ALTERNATIVE DESCRIPTIONS

This section describes No-Action Alternative A, as well as Action Alternatives B, C, D, E, and F. The elements and mitigation measures of the action alternatives are described in this section. Actions designed to protect resources during harvesting and road-improvement activities (stipulations and specifications) are incorporated into the Timber Sale Contract or site-preparation clauses and are put into use when the contract is administered. These stipulations and specifications are a form of mitigation that would be applied to an action alternative (see *STIPULATIONS AND SPECIFICATIONS, APPENDIX B).* Mitigation measures that were designed to reduce impacts on a particular resource are also discussed in Chapter III and in the particular resource's appendix.

No-Action Alternative A

- No timber harvesting would take place; salvage logging and firewood gathering would likely still occur.
- Beyond maintenance, roads would not be built and reconstructed.
- The old Woodward Creek bridge would not be removed and the bridge site would not be rehabilitated.
- Road and closure maintenance would continue when funding is available and equipment is in the area.
- Other recreational uses of the area, such as hiking, biking, berry picking, and fishing, are expected to continue.
- Fire suppression and weed-control efforts would continue.
- Natural events, including plant succession, trees blown down by wind, insect and disease outbreaks, and wildfires would continue to occur.
- Future actions, including timber harvesting, would be proposed and go through the appropriate environmental analysis before they would be done.

No-Action Alternative A, used as a baseline for comparing the effects that Action Alternatives B, C, D, E, and F have on the environment, is considered a possible alternative for selection.

Components Common to Action Alternatives B, C, D, E, and F

The ID Team developed timber-harvesting strategies for each action alternative within the framework of the SFLMP. All harvesting is based on the principles in the SFLMP, the trust mandate, and other legal considerations. Proposed treatments would, in the long-term, move timber stands toward a desired age class, species composition, structure, and density.

All action alternatives were designed to not harvest within Swan River State Forest's old-growth network. The old-growth network reflects the management strategies of Swan River State Forest to implement the 1998 Biodiversity Guidance as set forth in the SFLMP. The old-growth network was only meant as a management tool and no other commitments were ever made to that network. Some action alternatives would construct roads through the network.

All action alternatives were designed to be within the allowable water yield increases for the Main Woodward and South Woodward drainages.

This project was designed in accordance with *THE MONTANA BALD EAGLE MANAGEMENT PLAN* and *THE HABITAT MANAGEMENT GUIDE FOR BALD EAGLES IN NORTHWESTERN MONTANA*.

This project was also designed within the thresholds and guidelines established by the Swan Valley Grizzly Bear Conservation Agreement (SVGBCA).

All action alternatives implement the Governor's recommended actions for the restoration of bull trout. No timber harvesting would take place in streamside management zones (SMZ) of creeks where bull trout populations exist.

All action alternatives remove an old wooden bridge on Woodward Creek that accesses Road NW2538 in the northeast corner of Section 14, T23N, R18W (see any of the action alternative maps on the following pages). The ID Team determined that this bridge is a safety hazard and could allow sediment to enter Woodward Creek. The bridge site would be rehabilitated to prevent sediment from entering Woodward Creek in the future. After removing the bridge, approximately 0.5 mile of new road would be needed across the northwest corner of Section 25, T23N, R18W, to provide access for Road NW2538. Also, all action alternatives replace native and undersized culverts, repair culverts that are too short, and upgrade road-surface drainages so that Road NW2538 would meet current BMP standards.

Action Alternative B

This alternative is designed to maximize the money earned while keeping costs to a minimum. Timber harvesting focuses on older stands with high volumes that are located outside of the Swan River State Forest old-growth network. The cost of logging and transportation would be reduced by using:

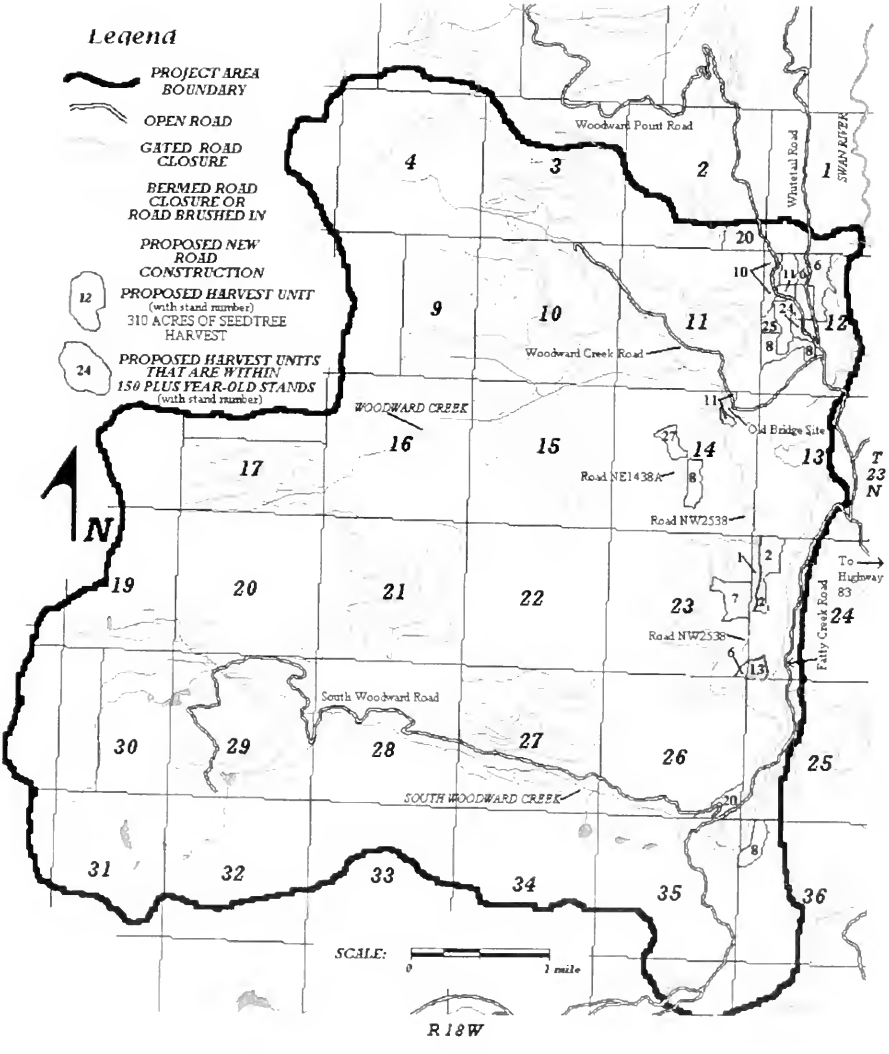
- existing roads where possible,
- conventional ground logging systems, and
- an even-aged harvest method.

Action Alternative B strives to move timber stands toward a more healthy and vigorous condition while still maintaining the desired forest species. Silviculturally, this alternative retains individual seedtrees and groups of trees to emulate fires that have partially or entirely replaced stands. Where available, 6 to 10 healthy western larch, Douglas-fir, and rust-resistant western white pine seedtrees per acre would be left. Clumps of western red cedar with full crowns would be left in areas where seedtrees are absent to help maintain species diversity and large trees into the future. Scattered clumps of healthy trees that are too young to be harvested in the understory would be retained to provide structure and some screening for wildlife. Piling slash with machines and burning the piles would reduce fire hazards and prepare the ground for seeds. All harvest units would be planted with western white pine seedlings that are resistant to blister rust.

Approximately 6 MMBF of timber would be harvested over 313 acres and one-half mile of road would be built with Action Alternative B. All roads used for hauling would be improved to meet current BMP standards.

Roads and proposed unit locations are shown in *FIGURE II-1 - PROJECT AREA MAP FOR ALTERNATIVE B*. Units are numbered according to the stand number in the Stand Level Inventory (SLI). Unit numbers may appear duplicated on the map, but they are unique to each section. For example, a unit referred to as 12-8 means Stand 8 in Section 12.

FIGURE II-1 - PROJECT AREA MAP FOR ALTERNATIVE B
(Unit numbers may appear duplicated on the map, but they are unique to each section)



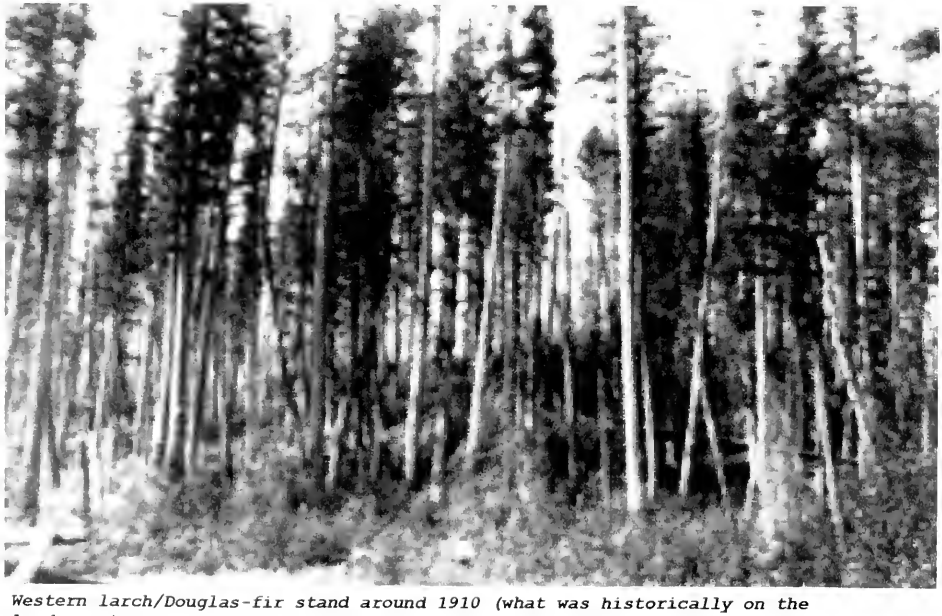
Action Alternative C

Action Alternative C primarily prioritizes the distribution of the forest structure, composition, and age-class so that the forest is more like the forest was historically. Harvesting focuses on timber stands that have a large percent of lodgepole pine trees older than 100 years, stands that do not have the appropriate types of trees, or stands where trees need their vigor improved or maintained. Some 150-year-plus stands that are not in Swan River State Forest's old-growth network would be harvested.

Silviculturally, our goals would strive to move timber stands toward the structure, composition, and density that was on the landscape historically. Action Alternative C would use commercial thinning to emulate mixed-severity fires or mountain pine beetle mortality.

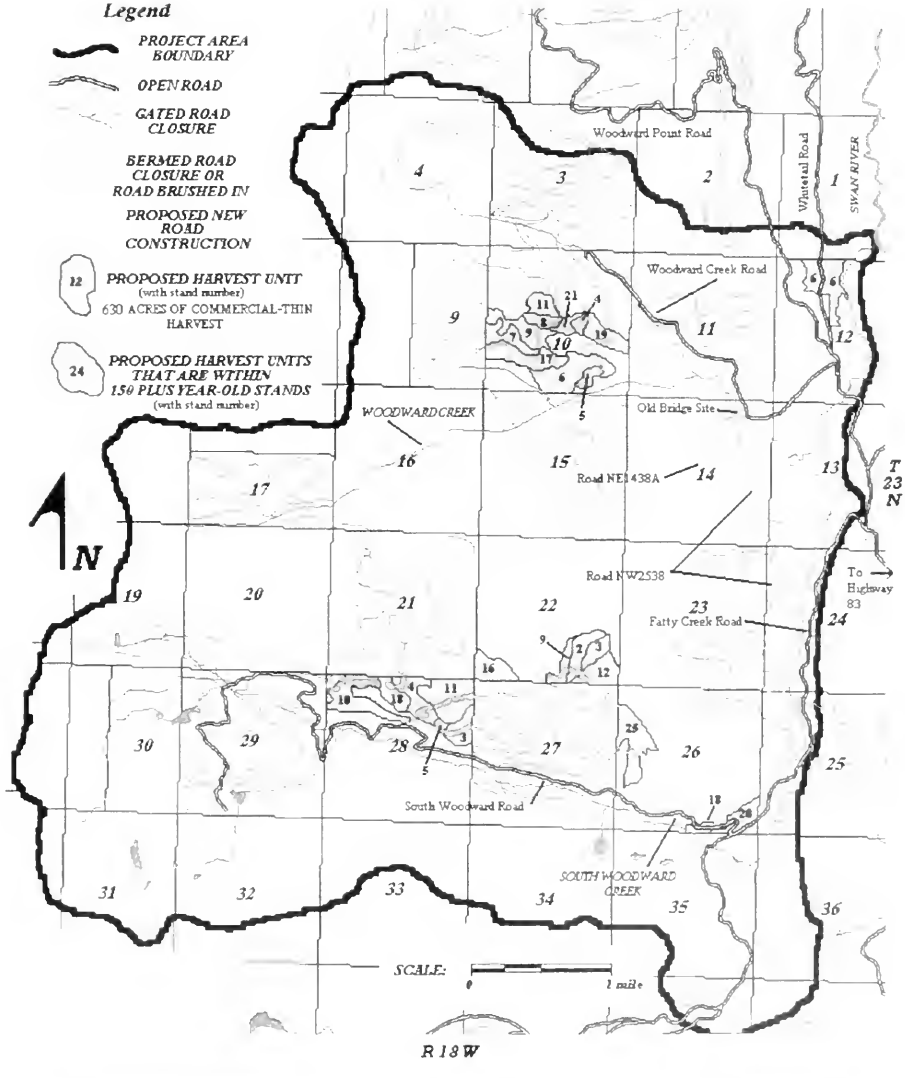
Approximately 100 trees per acre of healthy western larch, Douglas-fir, and rust-resistant western white pine would be left. To diversify species, clumps of western red cedar with full crowns would be left in areas where there are no retention trees. Scattered clumps of healthy young trees in the understory would be retained to provide some screening for wildlife. Piling slash with machines and burning the piles would reduce fire hazards and prepare the ground for seeds in the openings where no trees were retained.

Action Alternative C harvests approximately 5.4 MMBF of timber over 630 acres and builds 2.8 miles of road. All roads used for hauling would be improved to meet BMP standards.
Roads and proposed unit locations are shown in *FIGURE II-2- PROJECT AREA MAP FOR ACTION ALTERNATIVE C.*



Western larch/Douglas-fir stand around 1910 (what was historically on the landscape).

FIGURE II-2- PROJECT AREA MAP FOR ACTION ALTERNATIVE C
(Unit numbers may appear duplicated on the map, but they are unique to each section)



Action Alternative D

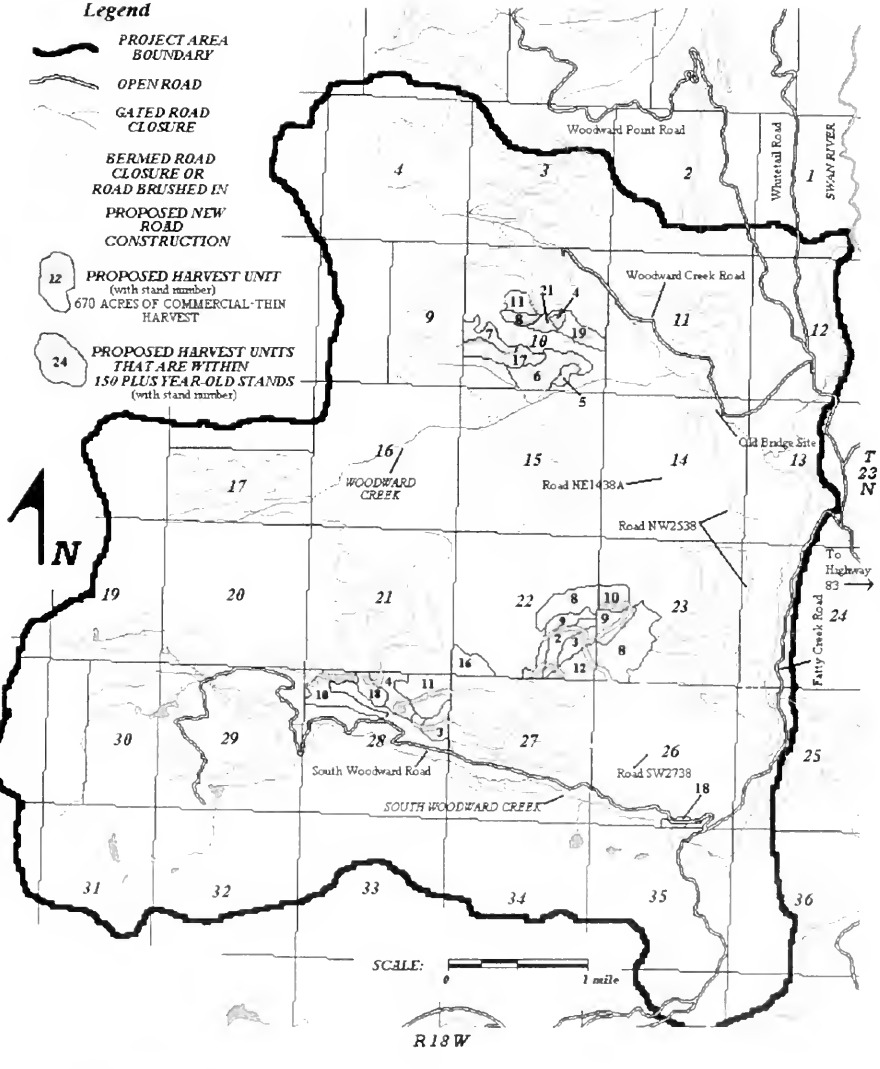
This alternative is the same as Action Alternative C, except no harvesting would take place in the 150-year-plus stands.

This alternative harvests approximately 5.3 MMBF of timber over 670 acres and builds 5.4 miles of road. All roads used for hauling would be improved to meet BMP standards.

Roads and proposed unit locations are shown in *FIGURE II-3 - PROJECT AREA MAP FOR ACTION ALTERNATIVE D.*

FIGURE II-3 - PROJECT AREA MAP FOR ACTION ALTERNATIVE D

(Unit numbers may appear duplicated on the map, but they are unique to each section)



Action Alternative E

Action Alternative E focuses on improving the Swan River State Forest road system. Developing access into areas to manage timber in the future and providing funding to improve the existing road system are the primary goals of this alternative. These improvements would bring roads up to BMP standards. The road system would be improved to withstand extensive use over time. The harvesting focuses on stands that are higher in value and near areas where road improvements are planned.

This alternative would use harvest methods that emulate a mixed-severity fire or mortality from mountain pine beetles and a stand-replacement fire.

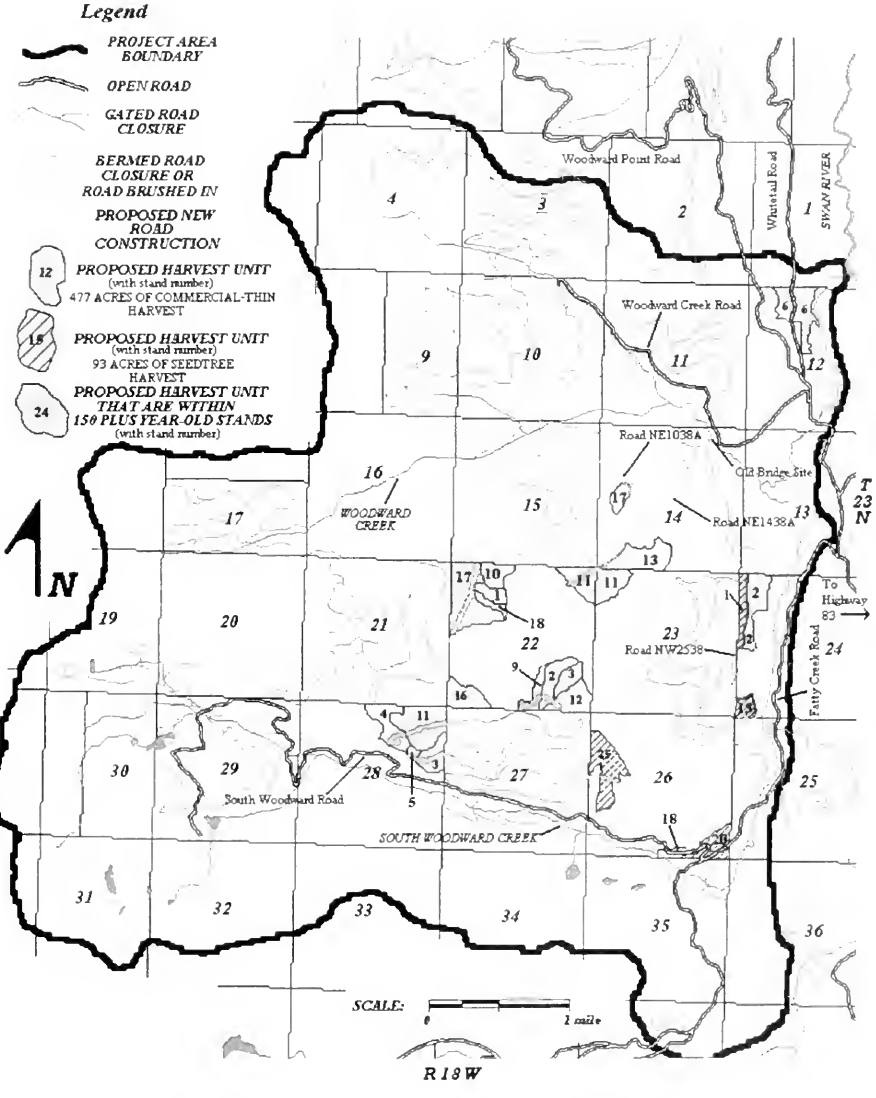
The harvest method that emulates a mixed-severity fire or mountain pine beetle mortality would strive to move the stand structure, composition, and stand density toward what was historically on the landscape. A commercial-thin harvest method would be utilized to meet its silvicultural goals. Approximately 100 trees per acre of healthy western larch, Douglas-fir, and rust-resistant western white pine would be left. Piling slash with machines and burning the piles would reduce fire hazards and prepare the ground for seeds in the openings where no trees were retained.

The harvest method that emulates stand-replacement fires would strive to move stands toward a more healthy and vigorous condition while maintaining the appropriate species. This harvest method would retain individual seedtrees and groups of trees. Where available, 6 to 10 healthy western larch, Douglas-fir, and rust-resistant western white pine trees would be left per acre. Clumps of western red cedar with full crowns would be left in areas where retention trees are absent to increase species diversity. Scattered clumps of healthy young trees in the understory would be retained to provide wildlife screening and stand structure. Machine piling slash and burning the piles would reduce fire hazards and prepare the ground for seeds in the openings where no trees are retained. These harvest units would be planted with western white pine seedlings that are resistant to blister rust.

Action Alternative E harvests approximately 5.8 MMBF of timber over 570 acres and builds 4.8 miles of road.

Roads and proposed unit locations are shown in *FIGURE II-4 - PROJECT AREA MAP FOR ACTION ALTERNATIVE E.*

FIGURE II-4 - PROJECT AREA MAP FOR ACTION ALTERNATIVE E
(Unit numbers may appear duplicated on the map, but they are unique to each section)



Action Alternative F

Action Alternative F focuses on minimizing new road construction and avoiding timber harvesting in old growth as defined in *Green et al (1992)*. The location of old growth within the project area can be found in *FIGURE II-5 - MAP OF OLD GROWTH AS DEFINED BY GREEN ET AL WITHIN THE SOUTH WOOD PROJECT AREA.*

This alternative would use harvest methods that emulate a mixed-severity fire or mortality from mountain pine beetles on 484 acres. The remaining 30 acres would emulate a stand-replacement fire.

The harvest method that emulates a mixed-severity fire or mountain pine beetle mortality would strive to move the stand structure, composition, and stand density toward what was historically on the landscape. A commercial-thin harvest method would be used to meet its silvicultural goals. Approximately 100 trees per acre of healthy western larch, Douglas-fir, and rust-resistant western white pine would be left. Piling slash with machines and burning the piles would reduce fire hazards and prepare the ground for seeds in the openings where no trees were available to retain.

The seedtree harvest method would emulate a stand-replacement fire and would strive to move stands toward a more healthy and vigorous condition while maintaining the appropriate species. This harvest method would retain individual seedtrees and groups of trees. Where available, 6 to 10 healthy western larch, Douglas-fir, and rust-resistant western white pine trees would be left per acre. Clumps of western red cedar with full crowns would be left in areas where retention trees are absent to increase species diversity. Scattered clumps of healthy young trees in the understory would be retained to provide wildlife screening and stand structure. Piling slash with machines and burning the piles would reduce fire hazards and prepare the ground for seeds in the openings where no trees are retained. These harvest units would be planted with western white pine seedlings that are resistant to blister rust.

Action Alternative F harvests approximately 4.5 MMBF of timber over 514 acres and builds 2.3 miles of road.

Roads and proposed unit locations are shown in *FIGURE II-6 - PROJECT AREA MAP FOR ACTION ALTERNATIVE F.*

FIGURE II-5 - MAP OF OLD GROWTH AS DEFINED BY GREEN ET AL WITHIN THE SOUTH WOOD PRJECT AREA

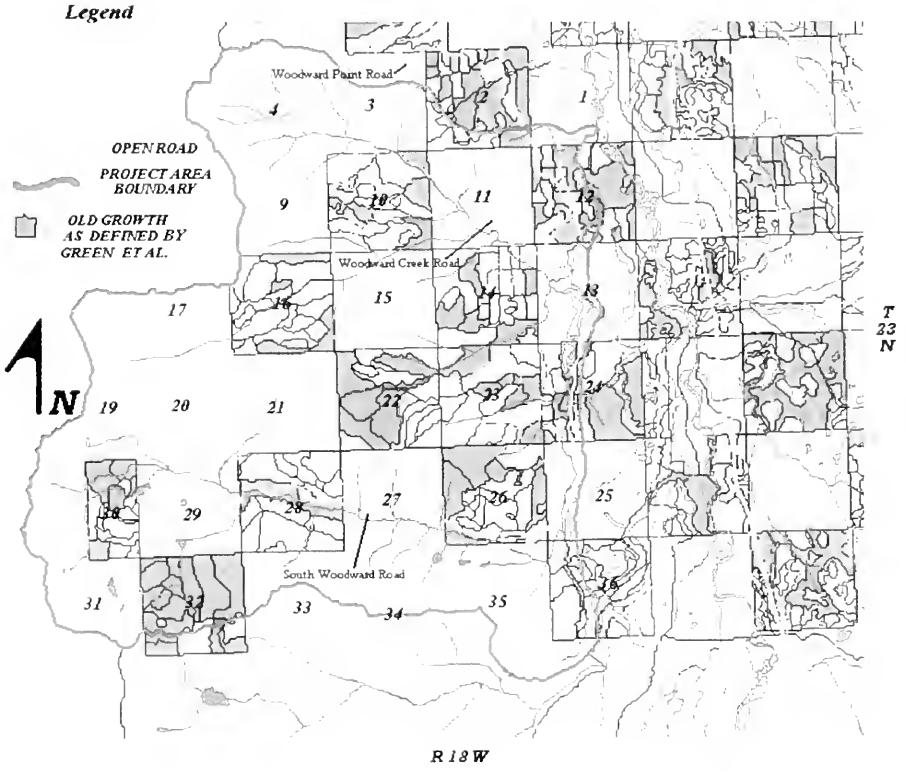


FIGURE II-6 - PROJECT AREA MAP FOR ACTION ALTERNATIVE F

(Unit numbers may appear duplicated on the map, but they are unique to each section)

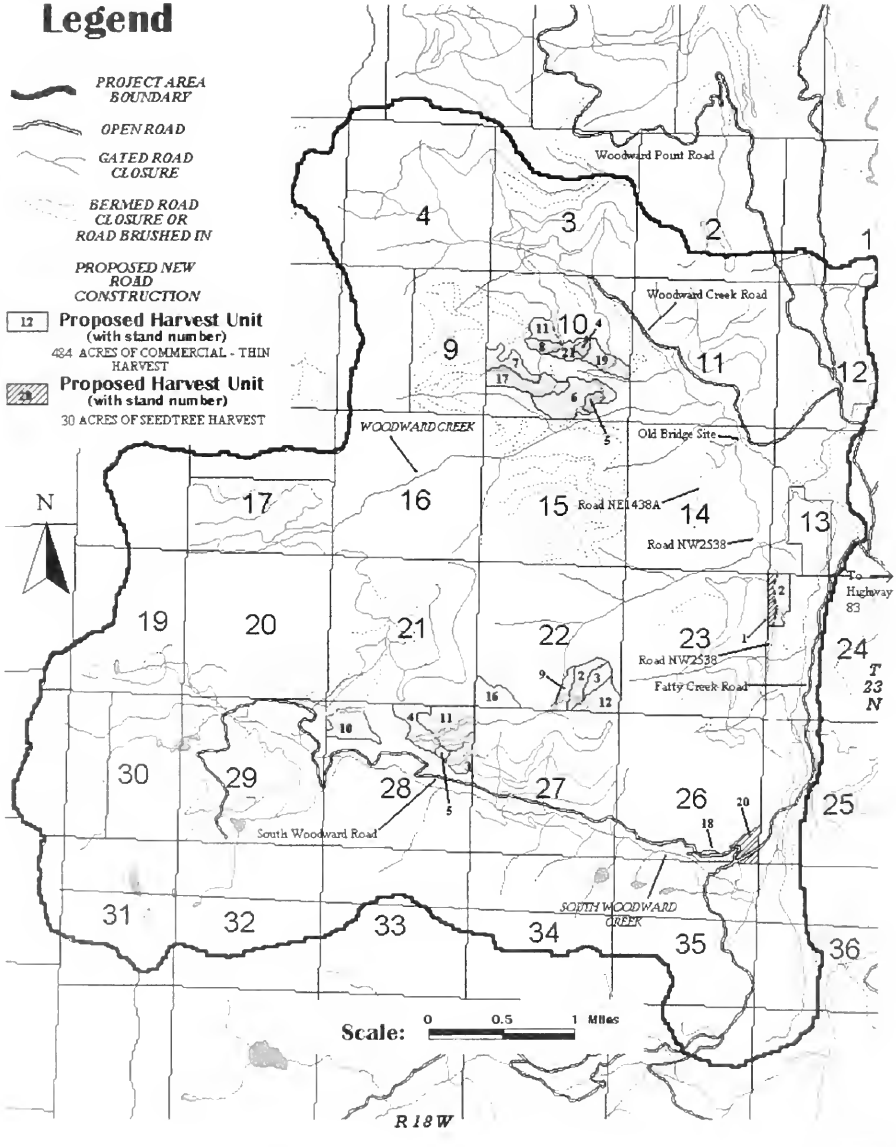


TABLE II-1: HIGHLIGHTS OF THE ACTION ALTERNATIVES

ALTERNATIVE	MMBF HARVESTED	ACRES	HARVEST METHOD	MILES OF NEW ROAD CONSTRUCTION	HAZARD REDUCTION AND SITE PREPARATION METHODS	REGENERATION
B	6.1	313	Seedtree	0.49	Pile, slash, and scarify ground with excavator.	Interplant with western white pine seedlings that are resistant to rust infections and rely on western larch and Douglas-fir to seed naturally.
C	5.4	628	Commercial thin	2.76	Spot pile with excavator and scarify openings or lop and scatter slash.	Rely on western larch, lodgepole pine, and Douglas-fir to seed naturally in openings.
D	5.3	668	Commercial thin	5.39	Excavator spot pile and scarify openings or lop and scatter slash.	Rely on western larch, lodgepole pine, and Douglas-fir to seed naturally in openings.
E	5.8	570	Seedtree (93 acres) Commercial thin (477 acres)	4.78	Pile and scarify seedtree units with excavator. Spot pile with excavator and scarify openings or lop and scatter slash in the commercial-thin units.	Interplant with western white pine seedlings that are resistant to rust infections; rely on western larch and Douglas-fir to seed naturally in the seedtree units. Rely on western larch, lodgepole pine, and Douglas-fir to seed naturally in openings in the commercial-thin units.
F	4.5	514	Seedtree (30 acres) Commercial thin (484 acres)	2.3	Pile and scarify seedtree units with excavator. Spot pile with excavator and scarify openings or lop and scatter slash in the commercial-thin units.	Interplant with western white pine seedlings that are resistant to rust infections; rely on western larch and Douglas-fir to seed naturally in the seedtree units. Rely on western larch, lodgepole pine, and Douglas-fir to seed naturally in openings in the commercial-thin units.

TABLE II-2—SUMMARY OF ENVIRONMENTAL EFFECTS

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
VEGETATION				
Forest Cover-type Distribution	The mixed-conifer cover type is increasing in abundance. The western white pine and western larch/ Douglas-fir cover types are decreasing in abundance.	***No Action Alternative A***		
		No effects	As new trees grow and fires are suppressed, the variety of cover types would be reduced.	Forest cover types in the Swan River State Forest SLI database were changed by the Small Squeezer and Small Squeezer II timber sales. There are now 3,451 acres of subalpine fir, 480 acres of Douglas-fir, 21 acres of hardwoods, 2,196 acres of lodgepole pine, 2,403 acres of ponderosa pine; 17,311 acres of mixed conifer, 7,927 acres of western larch/Douglas-fir, and 3,772 acres of western white pine cover types.
		Action Alternative B		
		80 acres of the mixed-conifer cover type would be moved to the western white pine cover type.	Applies a regeneration harvest to 313 acres. 6-10 healthy western larch, Douglas-fir, and western white pine seedtrees would be left per acre, with clumps of western red cedar and healthy young understory trees. A canopy closure of 10 to 25 percent would be retained.	In combination with Small Squeezer and Small Squeezer II timber sales, the lodgepole pine cover type is reduced by 120 acres; the mixed-conifer cover type is reduced by 137 acres; the western larch/Douglas fir cover type is increased by 177 acres; the western white pine cover type is increased by 80 acres.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Forest Cover-type Distribution *(cont.)*		***Action Alternative C***		
		The cover type on 98 acres would move from lodgepole pine to western larch/ Douglas-fir, 89 acres of mixed conifer to lodgepole pine, 282 acres from mixed conifer to western larch/ Douglas-fir, and 18 acres from mixed conifer to western white pine.	Applies a commercial thinning harvest to 628 acres. Retains approximately 100 trees per acre of healthy western larch/Douglas-fir and western white pine, with a canopy closure of 25 and 50 percent. Retains clumps of western red cedar and healthy young understory trees in the 1-to 2-acre openings where retention trees are absent.	In combination with Small Squeezer and Small Squeezer II timber sales, the lodgepole pine cover type would be reduced by 129 acres and the mixed-conifer cover type by 446 acres. The western larch/ Douglas-fir cover type would be increased by 557 acres and the western white pine cover type by 18 acres.
		Action Alternative D		
		The cover type on 98 acres would move from lodgepole pine to western larch/ Douglas-fir; 89 acres from mixed conifer to lodgepole pine; and 371 acres from mixed conifer to western larch/ Douglas-fir.	Applies a commercial-thin harvest to 668 acres. Retains approximately 100 trees per acre of healthy western larch/Douglas-fir and western white pine, with a canopy closure of 25 and 50 percent. Also retains clumps of western red cedar and scattered clumps of healthy young understory in the 1- to 2-acre openings where retention trees are absent.	In combination with Small Squeezer and Small Squeezer II timber sales, the lodgepole pine cover type would be reduced by 129 acres and the mixed-conifer cover type by 517 acres. The western larch/ Douglas-fir cover type would be increased by 646 acres.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Forest Cover-type Distribution *(cont.)*		***Action Alternative E***		
		The cover type on 66 acres would change from lodgepole pine to western larch/ Douglas-fir; 278 acres from mixed conifer to western larch/Douglas-fir; 33 acres from mixed conifer to lodgepole pine; 60 acres from subalpine fir to western larch/ Douglas-fir; and 18 acres from mixed conifer to western white pine.	Applies a regeneration harvest to 93 acres and a commercial-thin harvest to 477 acres. The regeneration harvest's indirect effects are the same as Action Alternative B. The commercial thin indirect effects are the same as Alternatives C and D. Approximately 100 trees per acre of healthy western larch/ Douglas-fir and western white pine would be retained, with a canopy closure of 25 and 50 percent. Retains clumps of western red cedar and scattered clumps of healthy young understory in the 1- to 2-acre openings where retention trees are absent.	In combination with Small Squeezer and Small Squeezer II timber sales, the subalpine fir cover type would be reduced by 60 acres, the lodgepole pine by 153 acres, and mixed-conifer by 386 acres. The western larch/ Douglas-fir cover type would be increased by 581 acres and the western white pine by 18 acres.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Forest Cover-type Distribution *(cont.)*		***Action Alternative F***		
		The cover type on 98 acres would move from lodgepole pine to western larch/ Douglas-fir; 89 acres from mixed conifer to lodgepole pine; 197 acres of mixed conifer to western larch/Douglas-fir; and 18 acres of mixed conifer would be regenerated to a western white pine cover type.	Applies a regeneration harvest to 30 acres. Retains 6 to 10 seedtrees per acre of healthy western larch/ Douglas-fir and western white pine, with clumps of western red cedar and healthy young understory trees. Retains a canopy closure of 10 and 25 percent. Applies a commercial-thin harvest to 484 acres. Retains approximately 100 trees per acre of healthy western larch/Douglas-fir and western white pine, with a canopy closure of 25 to 60 percent. Retains clumps of western red cedar and scattered clumps of healthy young understory in the 1- to 2-acre openings where retention trees are absent.	In combination with Small Squeezer and Small Squeezer II timber sales, the lodgepole pine cover type would be reduced by 129 acres and the mixed-conifer cover type by 361 acres. The western larch/ Douglas-fir cover type would be increased by 472 acres and the western white pine cover type by 18 acres.
Old-growth, as defined by *Green et al*	Swan River State Forest has 802 acres of old growth in the ponderosa pine cover type; 1,915 acres in western larch/Douglas-fir; 7,028 acres in mixed conifer; 1,930 acres in western white pine; and 1,114 acres of subalpine fir. Swan River State Forest has 12,789 acres identified as *Green et al* old growth.	***No Action Alternative A***		
		No effects	A stand-replacement fire would continue to be a risk over time. Old-growth attributes would increase over time.	No changes have occurred to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old-growth, as defined by Green et al *(cont.)*		***Action Alternative B***		
		Removes 112 acres of western white pine and 62 acres of mixed-conifer old growth.	174 acres would no longer be available for future old-growth consideration. Harvesting would decrease some old-growth characteristics, such as volume per acre, decadence, and tree-species diversity.	No changes have occurred to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.
		Action Alternative C		
		32 acres would no longer be western white pine old growth. 85 acres would no longer be mixed-conifer old growth.	Harvesting would decrease some old-growth characteristics, such as volume per acre, decadence, and tree-species diversity, but, by selectively harvesting, some valuable characteristics, such as diameter growth, would increase over time. 495 acres of stands in the 100-to-149-year age class would develop large trees faster, which could become old growth in the future.	No changes have occurred to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old-growth, as defined by *Green et al (cont.)*		***Action Alternative D***		
		Due to road construction, 0.5 acre of the mixed-conifer old-growth cover type and 5 acres of the western larch/Douglas-fir cover type would be removed.	Harvesting would decrease some old-growth characteristics, such as volume per acre, decadence, and tree-species diversity, but, by selectively harvesting, some valuable characteristics, such as diameter growth, would increase over time. 667 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	No changes have occurred to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.
		Action Alternative E		
		32 acres would no longer be western white pine old growth. 52 acres would no longer be mixed-conifer old growth. 60 acres would no longer be subalpine fir old growth. Road construction would also remove 6.4 acres of the western larch/Douglas-fir old-growth cover type, 0.5 acre of the mixed-conifer old-growth cover type, and 3 acres of the subalpine fir old-growth cover type.	62 acres would no longer be available for consideration as future old growth. Harvesting would decrease some old-growth characteristics, such as volume per acre, decadence, and tree-species diversity, but, by selectively harvesting, some valuable characteristics, such as diameter growth, would increase over time. 474 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	No change would occur to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old-growth, as defined by *Green et al (cont.)*		***Action Alternative F***		
		Due to road construction, 0.5 acre of the mixed-conifer old-growth cover type would be removed.	30 acres would no longer be available for consideration as future old growth. Harvesting would decrease some old-growth characteristics, such as volume per acre, decadence, and tree-species diversity, but, by selectively harvesting, some valuable characteristics, such as diameter growth, would increase over time. 484 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	No change would occur to Swan River State Forest's present SLI database by harvesting. Cumulative effects would be the same as the direct effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
WATER QUALITY				
Sediment Delivery	Roads are not contributing significant levels of sediment to stream crossings. Assessment of the watershed shows that the Woodward Creek watershed is in fair to good condition.	*No Action Alternative A*		
		No effects	No effects	No effects
		Action Alternative B		
		Rehabilitating an old bridge site, upgrading several existing stream-crossing sites, and constructing new crossing sites during the construction of approximately 0.5 miles of road may contribute sediment to streams in the short term.	Rehabilitating an old bridge site, constructing approximately 0.5 miles of new road, and upgrading BMPs on existing roads would create bare soil that may, in the short term, increase the risk of sediment entering local streams. But a net reduction in the risk of sediment delivery would result in the long term as the site revegetates. Creating bare soil on 61 acres of skid trails to harvest timber may contribute sediment to local streams until the sites revegetate.	Harvesting and constructing roads, when coupled with past harvesting and road-management activities, may cause an increase in sediment at the outlet of Woodward Creek.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Sediment Delivery *(cont.)*		***Action Alternative C***		
		Rehabilitating an old bridge site, upgrading several existing stream-crossing sites, and constructing new crossing sites during the construction of approximately 0.5 miles of road may contribute sediment to streams in the short-term. Replacement of 4 stream crossings may contribute short-term sediment to South Woodward Creek.	Rehabilitating an old bridge site, constructing approximately 0.5 miles of new road, and upgrading BMPs on existing roads would create bare soil that may, in the short term, increase the risk of sediment entering local streams. A net reduction in the risk of sediment delivery would result in the long term as sites revegetate. Replacing culverts would create bare soil that may cause sediment to enter South Woodward Creek until the sites revegetate. Creating 61 acres of bare soil on skid trails to harvest timber and building 2.3 miles of additional road may contribute sediment to local streams until the sites revegetate.	Harvesting and constructing roads, when coupled with past harvesting and road-management activities, may cause an increase in sediment at the outlet of Woodward Creek.
		Action Alternative D		
		Rehabilitating an old bridge site, upgrading several existing stream-crossing sites, and constructing new crossing sites during the construction of approximately 0.5 miles of road may contribute sediment to streams in the short term. Replacing 4 stream crossings may contribute sediment in the short term to South Woodward Creek.	Rehabilitating an old bridge site, constructing approximately 0.5 miles of new road, and upgrading BMPs on existing roads would create bare soil that may, in the short term, increase the risk of sediment entering local streams. But a net reduction in the risk of sediment delivery would result in the long term as sites revegetate. Replacing culverts would create bare soil that may cause sediment to enter South Woodward Creek until the sites revegetate. Creating 47 acres of bare soil on skid trails to harvest timber and building 4.9 miles of additional road may contribute sediment to local streams until the sites revegetate.	Harvesting and constructing road, when coupled with past harvesting and road-management activities, may cause an increase in sediment at the outlet of Woodward Creek.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Sediment Delivery (cont.)		***Action Alternative E***		
		Rehabilitating an old bridge site, upgrading several existing stream-crossing sites, and constructing new crossing sites during the construction of approximately 0.5 miles of road may contribute sediment to streams in the short-term. Replacing 4 stream crossings may contribute sediment to South Woodward Creek in the short term.	Rehabilitating an old bridge site, constructing approximately 0.5 miles of new road, and upgrading BMPs on existing roads would create bare soil that may, in the short term, increase the risk of sediment entering local streams. But a net reduction in the risk of sediment delivery would result in the long term as sites revegetate. Replacing culverts would create bare soil that may cause sediments to enter South Woodward Creek until the sites revegetate. Creating 70 acres of bare soil on skid trails and building 4.3 miles of additional road may contribute sediment to local streams until the sites revegetate.	Harvesting and constructing roads, when coupled with past harvesting and road-management activities, may cause an increase in sediment at the outlet of Woodward Creek.
		Action Alternative F		
		Rehabilitating an old bridge site, upgrading several existing stream-crossing sites, and constructing new crossing sites during the construction of approximately 0.5 miles of road may contribute sediment to streams in the short term. Replacing 4 stream crossings may contribute sediment to South Woodward Creek in the short term.	Rehabilitating an old bridge site, constructing approximately 0.5 miles of new road, and upgrading BMPs on existing roads would create bare soil that may, in the short term, increase the risk of sediment entering local streams. But a net reduction in the risk of sediment delivery would result in the long term as sites revegetate. Replacing culverts would create bare soil that may cause sediment to enter South Woodward Creek until the sites revegetate. Creating 46 acres of bare soil on skid trails and building 1.8 miles of additional road may contribute sediment to local streams until the sites revegetate.	Harvesting and constructing roads, when coupled with past harvesting and road-management activities, may cause an increase in sediment at the outlet of Woodward Creek.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Water Yield	Harvesting in Woodward Creek since the 1960s has increased water yield by 7.1 percent. Woodward Creek has 1,929 equivalent clearcut acres (ECAs); Main Woodward has 712 ECAs remaining and South Woodward has 1,217 ECAs.	***No Action Alternative A***		
		No effects	No effects	No effects
		Action Alternative B		
		No direct effects to water yield would be anticipated.	Removing trees on 313 acres would cause a water-yield increase of 0.3 percent for Woodward Creek (0.4 percent for Main Woodward and 0.2 percent for South Woodward).	The water yield would increase to 7.4 percent for Woodward Creek over unharvested conditions.
		Action Alternative C		
		No direct effects to water yield would be anticipated.	Removing trees on 628 acres would cause a water-yield increase of 0.5 percent for Woodward Creek (0.4 percent for Main Woodward and 0.6 percent for South Woodward).	The water yield would increase to 7.6 percent for Woodward Creek over unharvested conditions.
		Action Alternative D		
		No direct effects to water yield would be anticipated.	Removing trees on 667 acres would cause a water-yield increase of 0.6 percent for Woodward Creek (0.3 percent for Main Woodward and 0.8 percent for South Woodward).	The water yield would increase to 7.7 percent for Woodward Creek over unharvested conditions.
		Action Alternative E		
		No direct effects to water yield would be anticipated.	Removing trees on 570 acres would cause a water-yield increase of 0.5 percent for Woodward Creek (0.1 percent for Main Woodward and 0.9 percent for South Woodward).	The water yield would increase to 7.6 percent for Woodward Creek over unharvested conditions.
		Action Alternative F		
		No direct effects to water yield would be anticipated.	Removing trees on 514 acres would cause a water-yield increase of 0.4 percent for Woodward Creek (0.3 percent for Main Woodward and 0.4 percent for South Woodward).	The water yield would increase to 7.5 percent for Woodward Creek over unharvested conditions.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
FISHERIES				
	Surveys of species composition in the Woodward Creek watershed have identified the presence of brook trout, resident cutthroat trout, and bull trout.	***No Action Alternative A***		
		No effects would be expected.	The old bridge on Main Woodward Creek and several improperly designed culvert crossings are at risk of washing out and contributing sediment to local streams.	No effects would be expected.
		Action Alternative B		
		Improving BMPs, removing the bridge, and rehabilitating the bridge site on Road NW2538 may contribute some sediment to local creeks in the short term.	The BMP improvements to roads and the bridge removal and bridge-site rehabilitation on Road NW2538 may contribute some short-term sediment to gravel used for spawning in local creeks. The harvest systems used with this project are unlikely to deliver fine sediment to spawning streams.	The risk of increased sediment from in-channel sources would be unlikely because the allowable increase in water yield would not be met or exceeded with this alternative.
		Action Alternative C		
		Improving BMPs, removing the bridge, and rehabilitating the bridge site on Road NW2538 may contribute some sediment to local creeks in the short term. Culvert replacements on South Woodward Road may contribute some sediment to South Woodward Creek in the short term.	The BMP improvements to roads and the bridge removal and bridge-site rehabilitation on Road NW2538 may contribute some short-term sediment to gravel used for spawning in local creeks. The harvest systems used with this project are unlikely to deliver fine sediment to spawning streams. Culvert replacements on South Woodward Road may contribute some sediment to spawning gravel in South Woodward Creek in the short term.	The risk of increased sediment from in-channel sources would be unlikely because the allowable increase in water yield would not be met or exceeded with this alternative.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fisheries *(cont.)*		***Action Alternative D***		
		Improving BMPs, removing the bridge, and rehabilitating the bridge site on Road NW2538 may contribute some sediment to local creeks in the short-term. Culvert replacements on South Woodward Road may contribute some sediment to South Woodward Creek in the short-term.	The BMP improvements to roads and bridge removal and bridge-site rehabilitation on Road NW2538 may contribute some short-term sediment to gravel used for spawning in local creeks. The harvest systems used with this project are unlikely to deliver fine sediment to spawning streams. Culvert replacements on South Woodward Road may contribute some sediment to spawning gravel in South Woodward Creek in the short term.	The risk of increased sediment from in-channel sources would be unlikely because the allowable increase in water yield would not be met or exceeded with this alternative.
		Action Alternative E		
		Improving BMPs, removing the bridge, and rehabilitating the bridge site on Road NW2538 may contribute some sediment to local creeks in the short-term. Culvert replacements on South Woodward Road may contribute some sediment to South Woodward Creek in the short-term.	The BMP improvements to roads and the bridge removal and bridge-site rehabilitation on Road NW2538 may contribute some short-term sediment to gravel used for spawning in local creeks. The harvest systems used with this project are unlikely to deliver fine sediment to spawning streams. Culvert replacements on South Woodward Road may contribute some sediment to spawning gravel in South Woodward Creek in the short term.	The risk of increased sediment from in-channel sources would be unlikely because the allowable increase in water yield would not be met or exceeded with this alternative.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fisheries *(cont.)*		***Action Alternative F***		
		Improving BMPs, removing the bridge, and rehabilitating the bridge site on Road NW2538 may contribute some sediment to local creeks in the short term. Culvert replacements on South Woodward Road may contribute some sediment to South Woodward Creek in the short term.	The BMP improvements to roads and the bridge removal and bridge-site rehabilitation on Road NW2538 may contribute some short-term sediment to gravel used for spawning in local creeks. The harvest systems used with this project are unlikely to deliver fine sediment to spawning streams. Culvert replacements on South Woodward Road may contribute some sediment to spawning gravel in South Woodward Creek in the short term.	The risk of increased sediment from in-channel sources would be unlikely because the allowable increase in water yield would not be met or exceeded with this alternative.
WILDLIFE				
Bald Eagles	Though bald eagles do not use the area, the project area contains potential bald eagle habitat.	***No Action Alternative A***		
		None; the area is not presently used.	No harvesting is planned in potential eagle habitat. Long-term, the habitat quality would decline.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.
		Action Alternative B		
		None; the area is not presently used.	136 acres of potential eagle habitat would be altered. A slight net increase in habitat quality would be expected in the long term.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.
		Action Alternative C		
		None; the area is not presently used.	32 acres of potential eagle habitat would be altered. A slight net increase in habitat quality would be expected in the long term.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Bald Eagle *(cont.)*		***Action Alternative D***		
		None; the area is not presently used.	No harvesting is planned in potential eagle habitat. Long term, the habitat quality would decline.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.
		Action Alternative E		
		None; the area is not presently used.	32 acres of potential eagle habitat would be altered. A slight net increase in habitat quality would be expected in the long term.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.
		Action Alternative F		
		None; the area is not presently used.	No harvesting is planned in potential eagle habitat. Long-term, the habitat quality would decline.	Since the area is not used by bald eagles, the cumulative effects are the same as the indirect effects.
Canada Lynx	77 percent of the project area is suitable lynx habitat. There are 868 acres of lynx denning habitat.	***No Action Alternative A***		
		None expected.	In the long-term, denning habitat would increase while foraging habitat would decrease.	There would be no substantial loss of suitable habitat.
		Action Alternative B		
		None expected.	Harvesting would occur in marginal lynx habitat; therefore, negligible effects are expected.	Suitable habitat would be reduced by 1.5 percent.
		Action Alternative C		
		None expected.	No effect from harvesting would be expected. Construction of 2.8 miles of road, trapping, and a change in the predators competing for the prey base may potentially cause mortality.	There would be no substantial loss of suitable habitat.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Canada Lynx *(cont.)*			***Action Alternative D***	
		None expected.	No effect would be expected from harvesting. Construction of 5.4 miles of road, trapping, and a change in the predators competing for the prey base may potentially cause mortality.	There would be no substantial loss of suitable habitat.
			Action Alternative E	
		None expected.	No effect would be expected from harvesting. Construction of 4.8 miles of road, trapping, and a change in the predators competing for the prey base may potentially cause mortality.	Suitable habitat would be reduced by 1.0 percent.
			Action Alternative F	
		None Expected.	No effect from harvesting would be expected. Construction of 2.3 miles of road, trapping, and a change in the predators competing for the prey base may potentially cause mortality.	Suitable habitat would be reduced by 0.7 percent.
Grizzly Bear	The project area provides year-round habitat for grizzly bears. The Porcupine-Woodward Grizzly Bear Subunit has 78.2 percent hiding cover, and 31 percent of the subunit has open roads in excess of 1 mile per square mile.	***No Action Alternative A***		
		No effects.	No effects.	No effects.
		Action Alternative B		
		A minimal risk to grizzly bears.	42 percent of the subunit would have open roads in excess of 1 mile per square mile during implementation of the project. Forage would increase slightly and hiding cover would be slightly reduced.	Retains 77.3 percent of the subunit as hiding cover. Open-road densities would remain the same; 31 percent of the subunit has open roads in excess of 1 mile per square mile.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Grizzly Bear *(cont.)*		***Action Alternative C***		
		A minimal risk to grizzly bears.	46 percent of the subunit would have open roads in excess of 1 mile per square mile during implementation of the project. Forage would increase slightly and hiding cover would be slightly reduced.	Retains 76.5 percent of the subunit as hiding cover. Open-road densities would remain the same; 31 percent of the subunit has open roads in excess of 1 mile per square mile.
		Action Alternative D		
		A minimal risk to grizzly bears.	47 percent of the subunit would have open roads in excess of 1 mile per square mile during implementation of the project. Forage would increase slightly and hiding cover would be slightly reduced.	Retains 76.4 percent of the subunit as hiding cover. Open-road densities would remain the same; 31 percent of the subunit has open roads in excess of 1 mile per square mile.
		Action Alternative E		
		A minimal risk to grizzly bears.	45 percent of the subunit would have open roads in excess of 1 mile per square mile during implementation of the project. Forage would increase slightly and hiding cover would be slightly reduced.	Retains 76.6 percent of the subunit as hiding cover. Open-road densities would remain the same; 31 percent of the subunit has open roads in excess of 1 mile per square mile.
		Action Alternative F		
		A minimal risk to grizzly bears.	46 percent of the subunit would have open roads in excess of 1 mile per square mile during implementation of the project. Forage would increase slightly and hiding cover would be slightly reduced.	Retains 76.8 percent of the subunit as hiding cover. Open-road densities would remain the same; 31 percent of the subunit has open roads in excess of 1 mile per square mile.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Northern Rocky Mountain Wolf	The project area contains a small area that has potential as denning or rendezvous-site habitat. This habitat is probably not used by wolves due to the density of open roads.	***No Action Alternative A***		
		No effects would be expected.	No potential denning or rendezvous habitat would be harvested. The forest canopy closure would increase, reducing forage opportunities for their prey base slightly.	No cumulative effects would be expected due to no change in big game use of the area.
		Action Alternative B		
		35 acres of potential habitat would be harvested.	Harvesting would occur on 35 acres of potential denning or rendezvous habitat, which would decrease canopy closure and slightly increase forage opportunities for their prey bases.	No cumulative effects would be expected due to no change in big game use of the area.
		Action Alternative C		
		35 acres of potential habitat would be harvested.	Harvesting would occur on 35 acres of potential denning or rendezvous habitat, which would decrease canopy closure and slightly increase forage opportunities for their prey bases.	No cumulative effects would be expected due to no change in big game use of the area.
		Action Alternative D		
		No acres of potential habitat would be harvested.	No potential denning or rendezvous habitat would be harvested. The forest canopy closure would increase, reducing forage opportunities for their prey base slightly.	No cumulative effects would be expected due to no change in big game use of the area.
		Action Alternative E		
		35 acres of potential habitat would be harvested.	Harvesting would occur on 35 acres of potential denning or rendezvous habitat, which would decrease canopy closure and slightly increase forage opportunities for their prey bases.	No cumulative effects would be expected due to no change in big game use of the area.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Northern Rocky Mountain Wolf *(cont.)*	The project area contains a small area that has potential as denning or rendezvous-site habitat. This habitat is probably not used by wolves due to the density of open roads.	***Action Alternative F***		
		No acres of potential habitat would be harvested.	No potential denning or rendezvous habitat would be harvested. The forest canopy closure would increase, reducing forage opportunities for their prey base slightly.	No cumulative effects would be expected due to no change in big game use of the area.
Boreal Owl	The project area has 736 acres that are identified as, potentially, providing boreal owl habitat.	***No Action Alternative A***		
		No direct effects would be expected.	No effects	Boreal owl use and the quality of habitat would not be expected to change in the long term.
		Action Alternative B		
		No direct effects would be expected.	No harvesting would take place in boreal owl habitat.	Boreal owl use and the quality of habitat would not be expected to change in the long term.
		Action Alternative C		
		No direct effects would be expected.	No harvesting would take place in boreal owl habitat.	Boreal owl use and the quality of habitat would not be expected to change in the long term.
		Action Alternative D		
		No direct effects would be expected.	No harvesting would take place in boreal owl habitat.	Boreal owl use and the quality of habitat would not be expected to change in the long term.
		Action Alternative E		
		No direct effects would be expected.	Harvesting would take place on 63 acres of boreal owl habitat. Retaining trees would keep the harvested areas useable for boreal owls.	Boreal owl use and the quality of habitat would not be expected to change in the long term.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Boreal Owl *(cont.)*		***Action Alternative F***		
		No direct would be expected.	No harvesting would take place in boreal owl habitat.	Boreal owl use and the quality of habitat would not be expected to change in the long-term.
Fisher	The project area has 1,216 acres of preferred fisher habitat and 2,307 acres of suitable fisher habitat. Trapping, especially in close proximity of roads, is a significant source of mortality.	***No Action Alternative A***		
		No effects would be expected.	No effects.	No effects.
		Action Alternative B		
		A small chance for displacement would be expected.	Harvesting removes 232 acres of preferred, 6 acres of suitable, and 76 acres of travel habitats for a long period of time and increases the fisher's vulnerability to trapping by constructing 0.5 mile of new road.	Salvage harvesting in combination with Action Alternative B, especially in old growth, reduces the amount of habitat available. The additional roads make the fisher more vulnerable to death by trapping.
		Action Alternative C		
		A small chance for displacement would be expected.	Harvesting modifies, but does not exclude, fisher use from 18 acres of preferred, 406 acres of suitable, and 204 acres of travel habitats and increases the fisher vulnerability to trapping by constructing 2.8 miles of new road.	Salvage harvesting in combination with Action Alternative C, especially in old growth, reduces the amount of habitat available. The additional roads make the fisher more vulnerable to death by trapping.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fisher *(cont.)*		***Action Alternative D***		
		A small chance for displacement would be expected.	Harvesting modifies, but does not exclude fisher use from 45 acres of preferred, 411 acres of suitable, and 211 acres of travel habitats and increases the fisher vulnerability to trapping by constructing 5.4 miles of new road.	Salvage harvesting in combination with Action Alternative D reduces the amount of habitat available. The additional roads make the fisher more vulnerable to death by trapping.
		Action Alternative E		
		A small chance for displacement would be expected.	Harvesting modifies, but does not exclude fisher use from 81 acres of preferred, 233 acres of suitable, and 256 acres of travel habitats. Regeneration harvesting would remove 41 acres of preferred habitat and 93 acres of travel habitat for a long period of time. Harvesting also increases the fisher vulnerability to trapping by constructing 4.8 miles of new road.	Salvage harvesting in combination with Action Alternative E, especially in old growth, reduces the amount of habitat available. The additional roads make the fisher more vulnerable to death by trapping.
		Action Alternative F		
		A small chance for displacement would be expected.	Harvesting modifies, but does not exclude, fisher use from 51 acres of preferred, 376 acres of suitable, and 87 of travel habitats and increases the fisher vulnerability to trapping by constructing 2.3 miles of new road.	Salvage harvesting in combination with Action Alternative F reduces the amount of habitat available. The additional roads make the fisher more vulnerable to death by trapping.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Pileated Woodpecker	Approximately 1,552 acres within the project area provides potential nesting habitat for pileated woodpeckers.	***No Action Alternative A***		
		No effects	Over time, as large shade-intolerant trees die out and are replaced by shade-tolerant trees, habitat would decrease.	Nesting habitat would increase and then decline in the long term.
		Action Alternative B		
		Woodpeckers may be displaced for short periods of time. Some mortality may occur if trees used for nesting are disturbed during May and June.	Harvesting would remove 288 acres of potential nesting habitat.	Harvesting would add to the past removal of nesting habitat within the project area.
		Action Alternative C		
		Woodpeckers may be displaced for short periods of time. Some mortality may occur if trees used for nesting are disturbed during May and June.	Commercial thinning would modify 83 acres of potential nesting habitat and remove 51 acres of nesting habitat.	Harvesting would add to the past removal of nesting habitat within the project area.
		Action Alternative D		
		Woodpeckers may be displaced for short periods of time. Some mortality may occur if trees used for nesting are disturbed during May and June.	No nesting habitat would be affected.	Harvesting would not add to the past removal of nesting habitat within the project area.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Pileated Woodpecker *(cont.)*		***Action Alternative E***		
		Woodpeckers may be displaced for short periods of time. Some mortality may occur if trees used for nesting are disturbed during May and June.	Commercial thinning would modify 243 acres of potential nesting habitat and remove 55 acres of nesting habitat.	Harvesting would add to the past removal of nesting habitat within the project area.
		Action Alternative F		
		Woodpeckers may be displaced for short periods of time. Some mortality may occur if trees used for nesting are disturbed during May and June.	No nesting habitat would be affected.	Harvesting would not add to the past removal of nesting habitat within the project area.
Big Game	Various species of big game use the project area. The project area contains 385 acres of the 36,384-acre whitetail deer winter range.	***No Action Alternative A***		
		No effects would be expected.	No whitetail deer winter range would be modified.	No cumulative effects.
		Action Alternative B		
		Some big game may be displaced.	35 acres of whitetail deer winter range would be harvested.	35 acres of a 36,384-acre existing whitetail deer winter range would be harvested.
		Action Alternative C		
		Some big game may be displaced.	35 acres of whitetail deer winter range would be harvested.	35 acres of a 36,384-acre existing whitetail deer winter range would be harvested.
		Action Alternative D		
		Some big game may be displaced.	No white-tailed deer winter range would be modified.	No cumulative effects would be expected.
		Action Alternative E		
		Some big game may be displaced.	35 acres of white-tailed deer winter range would be harvested.	35 acres of a 36,384-acre existing white-tailed deer winter range would be harvested.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Big Game *(cont.)*		***Action Alternative F***		
		Some big game may be displaced.	No white-tailed deer winter range would be modified.	No cumulative effects would be expected.
SOILS				
	1,046 acres have been harvested on DNRC ownership within the Woodward drainage since the early 1960s.	***No Action Alternative A***		
		No effects would be expected.	No effects would be expected.	No effects would be expected.
		Action Alternative B		
		Soil compaction and displacement would be expected on 53 acres.	Reduced soil productivity would be expected on 53 acres. An increased risk of surface erosion would be expected on 61 acres.	Direct and indirect effects would be added to the past salvage harvesting activities within the proposed units.
		Action Alternative C		
		Soil compaction and displacement would be expected on 6 acres.	Reduced soil productivity would be expected on 6 acres. An increased risk of surface erosion would be expected on 61 acres.	Direct and indirect effects would be added to the past salvage harvesting activities within the proposed units.
		Action Alternative D		
		Soil compaction and displacement would be expected on 5 acres.	Reduced soil productivity would be expected on 5 acres. An increased risk of surface erosion would be expected on 47 acres.	Direct and indirect effects would be added to the past salvage harvesting activities within the proposed units.
		Action Alternative E		
		Soil compaction and displacement would be expected on 23 acres.	Reduced soil productivity would be expected on 23 acres. An increased risk of surface erosion would be expected on 70 acres.	Direct and indirect effects would be added to the past salvage harvesting activities within the proposed units.
		Action Alternative F		
		Soil compaction and displacement would be expected on 5 acres.	Reduced soil productivity would be expected on 5 acres. An increased risk of surface erosion would be expected on 46 acres.	Direct and indirect effects would be added to the past salvage harvesting activities within the proposed units.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
ECONOMICS				
	Expenditures are estimated to be $5,869 per pupil per year for children in grades kindergarten through 12 in Montana public schools.	***No Action Alternative A***		
		No revenue would be earned and no students per year would be supported.	No local jobs would be provided by harvesting timber.	Contribution to the profitability of DNRC's forest-management program would not occur.
		Action Alternative B		
		297 students for 1 year would be supported by the earned revenue of $1,789,331.	64.3 jobs would be provided locally for 1 year; $89,345 in Montana income tax and $43,740 in residential property tax would be collected. This additional tax would support 22 students for 1 year.	Averaged over the last 7 years, DNRC earned $2.03 for every dollar spent on forest management for FY 2000. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.
		Action Alternative C		
		195 students for 1 year would be supported by the earned revenue of $1,173,837.	56.8 jobs would be provided locally for 1 year; $79,336 in Montana income tax and $38,340 in residential property tax would be collected. This additional tax would support 20 students for 1 year.	Averaged over the last 7 years, DNRC earned $2.03 for every dollar spent on forest management For FY 2000. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.
		Action Alternative D		
		200 students for 1 year would be supported by the earned revenue of $1,196,500.	56.2 jobs would be provided locally for 1 year; $78,527 in Montana income tax and $37,935 in residential property tax would be collected. This additional tax would support 19 students for 1 year.	Averaged over the last 7 years, DNRC earned $2.03 for every dollar spent on forest management for FY 2000. This action alternative would continue to contribute to the probability of DNRC's forest-management program.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Economics *(cont.)*		***Action Alternative E***		
		218 students for 1 year would be supported by the earned revenue of $1,310,948.	61.2 jobs would be provided locally for 1 year; $85,514 in Montana income tax and $41,310 in residential property tax would be collected. This additional tax would support 21 students for 1 year.	Averaged over the last 7 years, DNRC earned $2.03 for every dollar spent on forest management for FY 2000. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.
		Action Alternative F		
		175 students for 1 year would be supported by the earned revenue of $1,054,378.	47.5 jobs would be provided locally for 1 year; $66,371 in Montana income tax and $32,063 in residential property tax would be collected. This additional tax would support 16 students for 1 year.	Averaged over the last 7 years, DNRC earned $2.03 for every dollar spent on forest management for FY 2000. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.
RECREATION				
	The project area receives use from commercial outfitting and noncommercial recreation.	***No Action Alternative A***		
		No effects would be expected.	No effects would be expected.	Recreationalists may avoid using some roads in the project area if they are not maintained.
		Action Alternative B		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may cause an inconvenience to recreationalists using the roads.	Recreationalists may avoid hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Recreation *(cont.)*	The project area receives use from commercial outfitting and noncommercial recreation.	***Action Alternative C***		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may cause an inconvenience to recreationalists using the roads.	Recreationalists may avoid hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.
		Action Alternative D		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may cause an inconvenience to recreationalists using the roads.	Recreationalists may avoid hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.
		Action Alternative E		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may inconvenience recreational use of the roads.	Recreationalists may avoid hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.
		Action Alternative F		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may inconvenience recreational use of the roads.	Recreationalists may avoid hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
AIR QUALITY				
	The project area contributes very low levels of air pollution to local population centers. Temporary reductions in air quality occur in the summer and fall from smoke generated from prescribed burning and vehicle dust.	***No Action Alternative A***		
		No effects would be expected.	No effects would be expected.	No effects would be expected.
		Action Alternative B		
		Postharvest burning would produce smoke and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.
		Action Alternative C		
		Postharvest burning would produce smoke and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.
		Action Alternative D		
		Postharvest burning would produce smoke and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.
		Action Alternative E		
		Postharvest burning would produce smoke and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.
		Action Alternative F		
		Postharvest burning would produce smoke and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
AESTHETICS				
	Foreground views are forest with openings. Middleground views are openings of various sizes resulting from 40 years of timber harvesting. Background views consist of the northeast portion of the Mission Range.	***No Action Alternative A***		
		Vegetation would continue to limit views from open roads.	No effects	No effects
		Action Alternative B		
		Open foreground views would become middleground views in the harvested areas along restricted roads. Except where cable logging occurs, the harvested areas would remain foreground views along open roads due to screening.	The seedtree units would be visually patterned to look like a mixed-severity or stand-replacement fire.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.
		Action Alternative C		
		Foreground views would have fewer trees in harvested areas.	The commercial-thin units would be patterned to look like a low-intensity mixed-severity burn by leaving an even distribution of trees across the landscape.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.
		Action Alternative D		
		Foreground views would have fewer trees in harvested areas.	The commercial-thin units would be patterned to look like a low-intensity mixed-severity burn by leaving an even distribution of trees across the landscape.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Aesthetics *(cont.)*		***Action Alternative E***		
		Seedtree units would become middleground views from restricted roads and have screened views along open roads. The commercial-thin units would remain foreground views, but with fewer trees.	The seedtree units would be visually patterned to look like a mixed-severity or stand-replacement fire.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.
		Action Alternative F		
		Seedtree units would become middleground views from restricted roads and have screened views along open roads. The commercial-thin units would remain foreground views, but with fewer trees.	The seedtree units would be visually patterned to look like a mixed-severity or stand-replacement fire.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.

SOUTH WOOD TIMBER SALE PROJECT PROPOSED DECISION

This portion of the FEIS presents the proposed decision by Robert L. Sandman, Manager, Stillwater/Swan Units, DNRC.

The scope of the proposed decision is limited to actions associated with the South Wood Timber Sale Project proposal. The proposed decision is site specific and is neither programmatic nor a general management plan for Swan River State Forest.

An ID Team has completed the DEIS and prepared the FEIS for the South Wood Timber Sale Project proposal. After a thorough review of the DEIS, project file, public correspondence, corrections, and additions made by DNRC that were reflected in this FEIS, Department policies, standards and guidelines, and the SFLMP, Mr. Sandman proposes the following decision.

1. PROPOSED ALTERNATIVE SELECTION

Six alternatives were developed and are presented in the FEIS (Alternatives A through F were presented in the *FEIS, pages II-1 through II-15)*:

- No-Action Alternative A includes the existing activities, but does not include a timber sale;
- Action Alternative B harvests approximately 6.1 million board feet (MMBF) from 313 acres and constructs 0.49 mile of new road;
- Action Alternative C harvests approximately 5.4 MMBF from 628 acres and constructs 2.76 miles of new road;
- Action Alternative D harvests approximately 5.3 MMBF from 668 acres and constructs 5.39 miles of new road;
- Action Alternative E harvests approximately 5.8 MMBF from 570 acres and constructs 4.78 miles of new road; and
- Action Alternative F, developed after publication of the DEIS, harvests approximately 4.5 MMBF from 514 acres and constructs 2.3 miles of new road (*FEIS, pages II-12 through II-14*).

No-Action Alternative A would not immediately affect the cover types or stand-age classes. However, without treatment or disturbance, cover types would continue to shift toward mixed-conifer stands and away from western larch/ Douglas-fir and western white pine stands identified as the desired future conditions. The percentage of area occupied by seedling-/ sapling-aged stands (0 to 40 years old) would continue to be low, and the area occupied by older-aged stands (150+ years old) would continue to be high (*FEIS, pages III-2 through III-20*). Because fire-suppression activities would continue, natural disturbances occurring by fire similar to historic proportions is unlikely, although old-growth stands are more susceptible to burning than in the past due to a build-up of down, dead fuels and shade-tolerant trees. Also, DNRC's premise is that, for the foreseeable future, timber management will continue to be the primary source of revenue and primary tool for achieving biodiversity objectives. Therefore, No-Action Alternative A most likely would not move Swan River State Forest in a direction that complies with the philosophy of the SFLMP or earn acceptable levels of income for the school trust.

To varying degrees, Action Alternatives B, C, D, E, and F meet project objectives and could be chosen.

The proposed decision is to select Action Alternative F, which is a modification of Action Alternatives C and E. The modifications are:

- Units 12-6, 10-9, and 26-25 from Action Alternative C were dropped from harvest consideration.
- Units 24-1 and 24-2 from Action Alternative E were added for harvest consideration.
- Since Unit 26-25 was dropped, the new road construction that was needed to access Unit 26-25 was also dropped.
- The harvest treatment for Unit 26-20 was changed from commercial thinning to seedtree.

Mr. Sandman has compared the modifications and specifications proposed for Action Alternative F to the analysis presented in the FEIS and has concluded that the modifications and specifications are within the scope of the FEIS.

The rationale for this decision is presented in item 4.

2. RELATIONSHIP OF THE OBJECTIVES TO THE PROPOSED DECISION

a. Action Alternative F would produce an estimated $1,054,378 return to the trust if sold in today's market.

b. The timber sale would contribute an estimated 4.5 MMBF to DNRC's annual timber harvest requirements.

c. Long-term timber productivity would be enhanced and insect infestations and disease infections would be reduced. Timber stands would move toward the desired future cover-type condition.

d. Streamside rehabilitation projects and site improvements on existing roads to improve drainage, water quality, and safety would be completed.

e. Options for sustained revenue to the school trust would be maintained.

3. RELATIONSHIP OF THE ISSUES AND PUBLIC COMMENT TO THE PROPOSED DECISION

a. Vegetation *(FEIS, pages III-2 through III-20)*

Action Alternative F changes 98 acres of the lodgepole pine cover type to a western larch/Douglas-fir cover type; 89 acres of the mixed-conifer cover type would become a lodgepole pine cover type; 197 acres of the mixed-conifer cover type would become a western larch/Douglas-fir cover type; and 18 acres of the mixed-conifer cover type would become a western white pine cover type. Harvesting would convert 11 acres of the 100-to-149-year age class to the 0-to-39-year age class, and 18 acres of the 150+-year age class would be converted to the 0-to-39-year age class.

Harvesting would immediately reduce the risk of insect infestations and disease infections on 514 acres. The cumulative changes in cover-type classification and age classes on Swan River State Forest would be toward the desired future condition.

Old Growth

DNRC has formally adopted the old-growth definitions proposed by *Green et al., (Old Growth Forest Types of the Northern Region, R-1 SES 4/92, USDA Forest Service, Northern Region, Missoula, MT)*. Using

the new definition, .5 acre of the new road construction and none of the proposed harvest units meet the definition of old growth based on *Green et al*.

b. Watershed and Hydrology (*FEIS, pages III-22 through III-24)*

The effects of Action Alternative F would create a short-term increase in sedimentation while improvement projects are in progress, but the prescribed activities would lead to a long-term net benefit to water quality by eliminating several existing potential sources of sediment.

Cumulatively, the annual water-yield increase and ECA caused by Action Alternative F would be below those allowed by DNRC standards set by the SFLMP and are not anticipated to reduce channel stability.

c. Fisheries *(FEIS pages III-26 through III-27)*

Short-term increases in sedimentation are anticipated during the construction of the bridge and road-improvement projects. However, planned mitigation measures would minimize the amount of sediment. All sites would result in a long-term reduction of sediment and long-term benefit to fisheries, including bull trout, in the project area. No measurable change in channel stability is expected.

d. Wildlife (FEIS, pages III-28 through III-33)

Efforts to convert stands to more adequately reflect historic conditions would benefit early-successional species at the expense of late-successional species. Cumulative effects to bald eagles, boreal owl, gray wolves, grizzly bears, Canada lynx, and big game would be negligible. Some reduction in pileated woodpecker habitat would occur until trees regenerate. Harvesting may modify fisher travel corridors. Road construction may make wildlife species more vulnerable to hunting and trapping.

e. Soils (*FEIS, pages III-34 through III-36)*

Reduced soil productivity would be expected on 5 acres, with an increased risk of surface erosion on approximately 46 acres. The area of soils affected would be limited to less than 15 percent of the total area of combined harvest units. Existing skid trails would be used to avoid cumulative impacts to soils; mitigation measures would be implemented to comply with BMPs and maintain long-term soil productivity.

f. Economics (*FEIS, pages H-1 through H-9)*

In today's market conditions, the proposed decision will generate approximately $1,054,378 in trust revenue. In addition, the sale will produce approximately $234,341 in forest improvement (FI) collections and fund approximately $82,793 for roadwork and bridge replacement. The revenue generated by this project represents support for 1 year for approximately 175 students and 47.5 local jobs.

g. Recreation (*FEIS, pages III-42 through III-43)*

As a whole, recreational revenues are not expected to change as a result of implementing Action Alternative F. Recreationists may be inconvenienced or temporarily displaced by project-related activities. Road restrictions associated with SVGBCA compliance would limit access in some areas to nonmotorized travel.

h. Air Quality (*FEIS, pages III-44 through III-45)*

Air-quality effects should not exceed allowable levels defined by the State of Montana Smoke Management Plan and managed by the Montana Air Shed Group.

i. Aesthetics *(FEIS, pages III-46 through III-48)*

The effects of Action Alternative F would result in limited views into the portion of harvest units that are visible from various vantage points, but the pattern of cover would vary from seedtree to commercial thinning. The result would be similar to a low-intensity, mixed-severity wildland fire.

j. Irretrievable and Irreversible Commitments (*FEIS, page III-50)*

The trees harvested, some more than 150 years old, would be irretrievably lost, but their loss would not be irreversible.

The project area is located on State-owned lands, which are principally valuable for the timber that is on them, growing more timber, or watershed protection *(MCA 77-1-402)*. The proposed timber sale is similar to past projects that have occurred in the area.

The proposed timber sale conforms to the management philosophy adopted by DNRC in the SFLMP and is in compliance with existing laws, policies, guidelines, and standards applicable to this type of proposed action.

4. RATIONALE FOR THE PROPOSED DECISION

a. Action Alternative F is consistent with the goals, objectives, and standards of the SFLMP.

b. No harvest units enter stands that meet the *Green et al* definition. Mr. Sandman's initial direction to the ID Team was to develop a project that did not rely on old-growth harvesting during a time of uncertainty surrounding DNRC's Old-Growth Guidance. That has been, and still is, the case. New legislation has added to the uncertainty surrounding old growth on State lands in the foreseeable future. Mr. Sandman does not expect resolution of the old-growth issues in time for implementation of this project.

c. The .5 acre of road construction that harvests old growth is required in order to access 500 MBF of timber, repair collapsing and correct undersized drainage structures on existing road systems, and avoid the need to construct an additional live-stream crossing site. Other routes were explored, but were deemed unfeasible due to geographic features, slopes, and

potential impacts. The harvested .5 acre is on the edge of a 7-acre old-growth stand. Because of its small size, it is highly unlikely that old-growth-associated species would utilize this old-growth stand.

d. Action Alternative F is silviculturally sound, accomplishes growth and health goals, reduces fire hazard, avoids old growth, and begins implementing some of the transportation system infrastructure goals, although not to the extent of Action Alternative E.

e. Action Alternative F is anticipated to provide a net return to the trust of $1,054,378 and provide some jobs and income for northwestern Montana in today's market. Although this alternative does not provide the highest net return, given the uncertainty surrounding old growth, it provides the most likely chance for successful completion and realization of income.

f. Of the alternatives that meet the project objectives, Action Alternative F appears to best address the comments and issues submitted by the general public. The predominant issue was harvesting in old-growth.

   Implementation would result in a long-term benefit to water quality and fisheries by reducing chronic and potential sources of sedimentation.

g. The prescribed treatments for Action Alternative F emulate natural disturbances, treat current disease infections and insect infestations, and promote a species mix more in line with DNRC's desired future condition.

SUMMARY

Overall, Action Alternative F complies with the philosophy of the SFLMP by harvesting timber in a manner that moves Swan River State Forest toward appropriate conditions while generating revenue and limiting effects to other valuable resources.

CHAPTER III

EXISTING ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

SOUTH WOOD TIMBER SALE PROJECT

CHAPTER III
EXISTING ENVIRONMENT
AND
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter III is a summary of resource conditions as they relate to the proposed South Wood Timber Sale Project. The current, or existing, condition can be viewed as a baseline condition to compare changes resulting from the selection of any of the alternatives. Also described is how each alternative may affect the environment. For more complete assessments and analyses related to the resources, for both scientific and judicial review, refer to the appropriate appendices of this EIS.

PROJECT AREA DESCRIPTION

The South Wood Timber Sale Project area is located primarily in the southwest corner of Swan River State Forest.

- The project encompasses approximately 16,000 acres in 13 sections and is located in the South Woodward and Woodward Creek drainages. Both creeks flow into Swan River, which empties into Swan Lake 10 miles to the north.
- The topography is composed of moderately steep valley slopes of 20 to 60 percent at elevations of 3,300 to 6,000 feet. Aspects are north, east, and south.
- The project area is accessed via Fatty Creek, South Woodward, and Woodward Creek roads from Highway 83.
- Adjacent landowners include private residences, industrial and nonindustrial timberlands, and United States Forest Service (USFS).

INTRODUCTION

The vegetation section addresses the potential effects of the proposed alternatives related to the following issues:

- timber cover types, the distribution of age classes, and the forest's canopy coverage;
- insects, diseases, and wildfire effects;
- old-growth amounts and how it was defined;
- sensitive plants; and
- noxious weeds.

The 3 geographic scales included in the vegetation analysis are:

- the Upper Flathead Climatic Section,
- the Swan River State Forest management block, and
- the South Wood Timber Sale Project level.

EXISTING VEGETATION

The existing vegetative types on Swan River State Forest and within the project area are a result of various site factors, fire regimes, and past management practices.

Within the South Wood Timber Sale Project area, more than 95 percent of the timber stands are in the warm to moist climatic regimes, including the grand fir and western red cedar habitat types. The remaining 5 percent are in the cool and moist climatic regimes, including the subalpine fir and Engelmann spruce habitat types. Large portions of the areas proposed for harvesting were regenerated after a stand-replacing fire in the 1890s. Most of the western larch and lodgepole pine stands proposed for commercial thinning were regenerated from this fire. Many of the old-growth stands were also influenced by this fire, but they probably only experienced low to moderate burning. This is exhibited by old survivor trees that are mixed with mature younger trees that are 100 to 110 years old. Other old-growth stands were unaffected or only slightly affected by the large fire.

Timber harvesting has been ongoing in the project area since the 1960s. Most stands were harvested with a clearcut or seedtree prescription. These stands have regenerated to a variety of species, which include western larch, Douglas-fir, western red cedar, western white pine, and grand fir.

DNRC has identified appropriate conditions by using historic data and has found that the mixed-conifer cover type is increasing in abundance, while the western larch/Douglas-fir and western white pine cover types are decreasing in abundance. Swan River State Forest is low in stands of the seedling/sapling age class (17.9 percent) and high in stands that are in the 150-year and older age class (46.2 percent).

The Douglas-fir bark beetle is attacking pockets of Douglas-fir across Swan River State Forest. White pine blister rust has reduced the number of western white pine trees in the project area. The hazards and risks associated with wildfires are at near-natural levels in stands that are being considered for thinning and have relatively low accumulations of downed and ladder fuels. The older stands in the vicinity escaped the stand-replacing fires of the past. A buildup of down, dead fuels and shade-tolerant trees, which provide ground and ladder fuels, make these old-growth stands more susceptible to burning than in the past.

DNRC recently changed how it defines

old-growth forests and has formally adopted the old-growth definitions proposed by *Green et al (1992)*. This definition is different from how old growth was defined by DNRC in the SFLMP Biodiversity Guidance section. The South Wood Timber Sale Project has been developed while these definition changes were being considered and adopted. For this reason, the South Wood Timber Sale FEIS analyzes effects to old growth as defined by *Green et al*, while the DEIS used the previous Biodiversity Guidance.

The Swan River State Forest SLI identifies 12,789 acres of old growth using the *Green et al* definition. These acres are approximately 34 percent of the forested acres on Swan River State Forest.

Using the Biodiversity Guidance definition for old growth, the current SLI indicates as old growth approximately 1,114 acres of subalpine fir, 7,028 acres of mixed-conifer, 802 acres of ponderosa pine, 1,915 acres of western larch/ Douglas-fir, and 1,930 acres of western white pine cover types on Swan River State Forest. Many western larch/Douglas-fir stands have been converted to mixed-conifer stands by the growth of shade-tolerant species; lodgepole pine stands are in the younger age classes.

Numerous sensitive plants have been identified on Swan River State Forest. Within the South Wood Timber Sale Project area, 3 plant species and 5 occurrences were found: 2 species were found in wet meadows, fens, and riparian areas, and 1 inhabits western red cedar forests close to moist sites.

Spotted knapweed and St. John's-wort weed populations have become established along the road edges within the project area.

Typical Swan landscape

Direct, Indirect, and Cumulative Effects of No-Action Alternative 1 (Existing Condition)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	The mixed-conifer, subalpine fir, and lodgepole pine cover types would continue to increase on Swan River State Forest. The western larch/ Douglas-fir and western white pine cover types would continue to decrease.	N/A	N/A
Age Class	No change	Stands in all age classes would continue to grow older. Old-growth acres would increase in the absence of wildfires or management.	Fewer acres would contain young age classes. As stands age and die, there would be fewer replacement acres over the long term.
Canopy Coverage	No change - stands proposed for harvesting would stay at more than 70 percent canopy coverage.	No changes would be expected.	No changes would be expected.
Insects, Diseases, and Fires	No changes would be expected.	Fire hazards would slowly progress to higher fire hazard for stand-replacement fires. Insect and disease problems would continue to increase as stands age.	Over the long term insect infestations, disease infections, and fire hazards would increase.
Old Growth, as defined by *Green et al*	No change to the existing old growth cover types: 1,114 acres of subalpine fir, 7,028 acres of mixed conifer, 802 acres of ponderosa pine, 1,915 acres of western larch/Douglas-fir, and 1,930 acres of western white pine.	As aging trees increase the amount of old-growth acres, all cover types would increase.	N/A

Direct, Indirect, and Cumulative Effects of No-Action Alternative 1 (Existing Condition) (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fragmentation	Historically, forest fires played a major role in forest disturbance. This has resulted in a patchwork of forest stands that have a variety of shapes, sizes, and ages. Recent fire suppression activities have reduced the impacts of fire in the forest, while land development and logging have become the primary means of disturbance within the forest.	No effects.	No effects.
Noxious Weeds	Noxious weed population would continue as they exist. Log hauling and logging on adjacent ownerships and recreational use would continue to introduce weed seeds.	Noxious weed population would continue as they exist. Log hauling and logging on adjacent ownerships and recreational use would continue to introduce weed seeds.	N/A

Direct, Indirect, and Cumulative Effects of Action Alternative B

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	With regeneration harvesting, 80 acres would convert from the mixed-conifer to the western white pine cover type.	N/A	The lodgepole pine cover type on 120 acres would change to a western larch/Douglas fir cover type; a mixed-conifer cover type on 57 acres would change to a western larch/ Douglas-fir cover type; and 80 acres of a mixed-conifer cover type would change to a western white pine cover type.
Age Class	111 acres would convert from the 100-to-149-year age class to a 0-to-39-year age class; 202 acres would convert from 150-plus years to the 0-to-39-year age class.	313 acres of 3- to 40-acre patches would emulate "mixed-severity flareups" across the project area.	On Swan River State Forest, the 0-to-39-year age class would change from 17.9 percent to 19.1 percent; the 40-to-99-year age class would change from 17.8 percent to 17.6 percent; the 100-to-149-year age class would change from 18.1 percent to 17.6 percent; and the 150+-year age class would change from 46.2 percent to 45.6 percent.
Canopy Coverage	N/A	On 313 acres, regeneration harvesting would reduce 70 percent canopy cover to 10 to 25 percent.	N/A
Insects, Diseases, and Fires	Old-aged and diseased trees would be removed from 313 acres; slash would be a fire hazard in the short term.	On 313 acres, fire hazard would be very low after the slash is treated. On 248 acres, western white pine infected with blister rust would be replaced with rust-resistant western white pine regeneration.	19.1 percent of Swan River State Forest would be in a very low fire-hazard class (0-to-39-year age class). Fewer trees would be affected by insects and diseases.
Old Growth, as defined by Green et al	112 acres would no longer be western white pine old growth. 62 acres would no longer be mixed-conifer old growth.	174 acres would no longer be available for future old-growth consideration.	112 acres would no longer be western white pine old growth. 62 acres would no longer be mixed-conifer old growth. Due to road construction, 0.5 acre of the mixed-conifer cover type would be removed.

Direct, Indirect, and Cumulative Effects of Action Alternative B (continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fragmentation	Generally, patch size would not change since proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. Generally, the proposed commercial-thin harvesting would not change the patch size, age, or shape.	The seedtree harvest units that are located next to past harvest units and other proposed harvest units may result in bigger patches of the younger age class. Commercial-thin harvesting across several stands would tend to reduce the differences between stands and increase patch size.	Seedtree harvesting would increase the amount of patches of the younger-aged class and move the forest toward historic conditions.
Noxious Weeds	Soil would be disturbed to provide seedbeds for weed seeds.	Weed seeds may be carried onto the site by vehicles and machinery related to harvesting.	All action alternatives, together with other State logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for weed seeds carried in by vehicles from off site.

Direct, Indirect, and Cumulative Effects of Action Alternative C

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	The lodgepole pine cover type on 98 acres would change to a commercially-thinned western larch/Douglas-fir cover type; the mixed-conifer cover type on 89 acres would change to a commercially-thinned lodgepole pine cover type; the mixed-conifer cover type on 282 acres would change to a commercially-thinned western larch/Douglas-fir cover type; and the mixed-conifer cover type on 18 acres would change to a commercially-thinned western white pine cover type.	The mixed-conifer cover type would develop at a reduced rate due to the removal of shade-tolerant trees in the commercially-thinned western larch/Douglas fir, lodgepole pine, and western white pine cover types.	129 acres would no longer be in the lodgepole pine cover type; 446 acres would no longer be in the mixed-conifer cover type; 557 acres would convert to a western larch/Douglas-fir cover type; 18 acres would convert to a western white pine cover type.
Age Class	No change	Diameter growth on the remaining trees would increase due to the availability of light and water.	On Swan River State Forest, the 0-to-39-year age class would change from 17.9 to 18.3 percent; the 40-to-99-year age class would change from 17.8 to 17.6 percent; the 100-to-149-year age class would change from 18.1 to 17.9 percent; the 150+-year age class would not change from 46.2 percent.
Canopy Coverage	N/A	Commercial thinning on 629 acres would reduce 70 percent canopy cover to 26 to 60 percent.	N/A
Insects, Diseases, and Fires	629 acres would contain fewer insect-infested and disease-infected trees. The slash fire hazard would be short term.	On 629 acres, the diameter growth on remaining trees would improve and their resistance to insects and diseases would increase. Mortality risk from low- to moderate-intensity fires would be reduced.	Fewer trees would be affected by insects and diseases across Swan River State Forest.

Direct, Indirect, and Cumulative Effects of Action Alternative C (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old Growth, as defined by *Green et al*	32 acres would no longer be western white pine old growth. 85 acres would no longer be mixed-conifer old growth.	495 acres of stands in the 100-to-149-year age class would develop large trees faster, which, if needed, could become old growth to meet DNRC's commitment in the future.	The mixed-conifer cover type on 85 acres would change to a western larch/ Douglas-fir cover type; the western white pine cover type on 32 acres would remain a western white pine cover type. Due to road construction, 0.5 acre of the mixed-conifer cover type would be removed.
Fragmentation	Generally, patch size would not change since proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. Generally, the proposed commercial-thin harvesting would not change the patch size, age, or shape.	The seedtree harvest units that are located next to past harvest units and other proposed harvest units may result in bigger patches of the younger age class. Commercial-thin harvesting across several stands would tend to reduce the differences between stands and increase patch size.	Seedtree harvesting would increase the amount of patches of the younger age class and move the forest toward historic conditions.
Noxious Weeds	Soil would be disturbed to provide seedbeds for weed seeds.	Weed seeds may be carried onto the site by vehicles and machinery related to harvesting.	All action alternatives, together with other State logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for weed seeds carried in by vehicles from off site.

Direct, Indirect, and Cumulative Effects of Action Alternative D

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	The lodgepole pine cover type on 98 acres would change to a commercially-thinned western larch/Douglas-fir cover type; the mixed-conifer cover type on 89 acres would change to a commercially-thinned lodgepole pine cover type; the mixed-conifer cover type on 371 acres would change to a commercially-thinned western larch/ Douglas-fir cover type.	The mixed-conifer cover type would develop at a reduced rate due to the removal of shade-tolerant trees in the commercially-thinned western larch/ Douglas-fir, lodgepole pine, and western white pine cover types.	129 acres would no longer be a lodgepole pine cover type; 517 acres would no longer be a mixed-conifer cover type; 646 acres would be converted to a western larch/ Douglas-fir cover type.
Age Class	No change	Diameter growth on the remaining trees would increase due to light and water availability.	On Swan River State Forest, the 0-to-39-year age class would change from 17.9 to 18.3 percent; the 40-to-99-year age class would change from 17.8 to 17.6 percent; the 100-t0-149-year age class would change from 18.1 to 7.9 percent; the 150+-year age class would not change from 46.2 percent.
Canopy Coverage	N/A	On 667 acres, 70 percent canopy cover would be reduced to 26 to 60 percent by commercial thinning.	N/A
Insects, Diseases, and Fires	On 667 acres, there would be fewer insect-infested and disease-infected trees. The slash fire hazard would be short term.	On 667 acres, the diameter growth of the remaining trees would improve; their resistance to insects and diseases would increase. Mortality risk from low- to moderate-intensity fires would be reduced.	Fewer trees would be affected by insects and diseases across Swan River State Forest.

Direct, Indirect, and Cumulative Effects of Action - Alternative D (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old Growth, as defined by *Green et al*	Due to road construction, 0.5 acres of the mixed-conifer old-growth cover type and 5 acres of the western larch/ Douglas-fir cover type would be removed.	667 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	Due to road construction, 0.5 acre of the mixed-conifer old-growth cover type and 5 acres of the western larch/ Douglas-fir cover type would be removed.
Fragmentation	Generally, patch size would not change since proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. Generally, the proposed commercial-thin harvesting would not change the patch size, age, or shape.	The seedtree harvest units that are located next to past harvest units and other proposed harvest units may result in bigger patches of the younger age class. Commercial-thin harvesting across several stands would tend to reduce the differences between stands and increase the patch size.	Seedtree harvesting would increase the amount of patches of the younger age class and move the forest toward historic conditions.
Noxious Weeds	Soil would be disturbed to provide seedbeds for weed seeds.	Weed seeds may be carried onto the site by vehicles and machinery related to harvesting.	All action alternatives, together with other State logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for weed seeds carried in by vehicles from off site.

Direct, Indirect, and Cumulative Effects of Action Alternative E

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	The subalpine fir cover type on 60 acres would change to a commercially-thinned western larch/Douglas-fir cover type; the lodgepole pine cover type on 66 acres would change to a commercially-thinned western larch/Douglas fir cover type; the mixed-conifer cover type on 33 acres could change to a commercially-thinned lodgepole pine cover type; the mixed-conifer cover type on 278 acres would change to a commercially-thinned western larch/Douglas fir cover type; the mixed-conifer cover type on 18 acres would change to a commercially-thinned western white pine cover type.	The mixed-conifer cover type would develop at a reduced rate due to the removal of shade-tolerant trees in the commercially-thinned western larch/ Douglas-fir, lodgepole pine, and western white pine cover types.	60 acres would no longer be a subalpine fir cover type; 153 acres would no longer be a lodgepole pine cover type; 386 acres would no longer be a mixed-conifer cover type; 581 acres would be converted to a western larch/ Douglas-fir cover type; 18 acres would be converted to a western white pine cover type.
Age Class	22 acres would convert from a 100-to-149-year age class to a 0-to-39-year age class; 71 acres would convert from 150+-year age class to a 0-to-39-year age class.	93 acres of 3- to 40-acre patches would emulate "mixed-severity flareups" across the project area.	On Swan River State Forest, the 0-to-39-year age class would change from 17.9 to 18.6 percent; the 40-to-99-year age class would change from 17.8 to 17.6 percent; the 100-to-149-year age class would change from 18.1 to 17.8 percent; the 150+-year age class would change from 46.2 to 46.0 percent.

Direct, Indirect, and Cumulative Effects of Action Alternative E (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Canopy Coverage	N/A	On 93 acres, 70 percent canopy cover would be reduced to 10 to 25 percent by regeneration harvesting. On 477 acres, 70 percent canopy cover would be reduced to 35 to 60 percent by commercial thinning.	N/A
Insects, Diseases, and Fires	Old-aged and diseased trees would be removed from 93 acres; 477 acres would have fewer insect-infested and disease-infected trees. The slash fire hazard would be short term.	The fire hazard would be very low on 93 acres after slash is treated. On 477 acres, the diameter growth of the remaining trees would improve; their resistance to insects and diseases would increase. Mortality risk from low- to moderate-intensity fires would be reduced.	18.6 percent of Swan River State Forest would be in a very low fire-hazard class (0-to-39-year age class). Fewer trees would be affected by insects and diseases.
Old Growth, as defined by *Green et al*	32 acres would no longer be western white pine old growth. 52 acres would no longer be mixed-conifer old growth. 60 acres would no longer be subalpine fire old growth. Road construction would also remove 6.4 acres of the western larch/ Douglas-fir old-growth cover type, 0.5 acre of the mixed-conifer old-growth cover type, and 3 acres of the subalpine fir old-growth cover type.	53 acres would no longer be available for consideration as future old growth. 474 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	60 acres would change from the subalpine fir to the western larch/Douglas-fir cover type; 32 acres of the western white pine cover type would remain western white pine; and 52 acres of the mixed-conifer old growth would be regenerated. Road construction would also remove 6.4 acres of the western larch/ Douglas-fir old-growth cover type, 0.5 acre of the mixed-conifer old-growth cover type, and 3 acres of the subalpine fir old-growth cover type.

Direct, Indirect, and Cumulative Effects of Action Alternative E (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fragmentation	Generally, patch size would not change since proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. Generally, the proposed commercial-thin harvesting would not change the patch size, age, or shape.	The seedtree harvest units that are located next to past harvest units and other proposed harvest units may result in bigger patches of the younger age class. Commercial-thin harvesting across several stands would tend to reduce the differences between stands and increase the patch size.	Seedtree harvesting would increase the amount of patches of the younger age class and move the forest toward historic conditions.
Noxious Weeds	Soil would be disturbed to provide seedbeds for weed seeds.	Weed seeds may be carried onto the site by vehicles and machinery related to harvesting.	All action alternatives, together with other State logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for weed seeds carried in by vehicles from off site.

Direct, Indirect, and Cumulative Effects of Action Alternative F

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Cover Type	The lodgepole pine cover type on 98 acres would change to a commercially-thinned western larch/Douglas-fir cover type; the mixed-conifer cover type on 89 acres would change to a commercially-thinned lodgepole pine cover type; the mixed-conifer cover type on 197 acres would change to a commercially-thinned western larch/Douglas-fir cover type; and the mixed-conifer cover type on 18 acres would change to a commercially-thinned western white pine cover type.	The mixed-conifer cover type would develop at a reduced rate due to the removal of shade-tolerant trees in the commercially-thinned western larch/Douglas-fir, lodgepole pine, and western white pine cover types.	129 acres would no longer be in the lodgepole pine cover type; 361 acres would no longer be in the mixed-conifer cover type; 472 acres would convert to a western larch/Douglas-fir cover type; 18 acres would convert to a western white pine cover type.
Age Class	11 acres would convert from a 100-to-149-year age class to a 0-to-39-year age class; 18 acres would convert from 150+-year age class to a 0-to-39-year age class.	29 acres of 3- to 40-acre patches would emulate "mixed-severity flareups" across the project area.	On Swan River State Forest, the 0-to-39-year age class would change from 17.9 to 18.4 percent; the 40-to-99-year age class would change from 17.8 to 17.6 percent; the 100-to-149-year age class would change from 18.1 to 17.6 percent; the 150+-year age class would change from 46.2 to 46.1 percent.

Direct, Indirect, and Cumulative Effects of Action - Alternative F (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Canopy Coverage	N/A	On 30 acres, 70 percent canopy cover would be reduced to 10 to 25 percent by regeneration harvesting. On 126 acres, 70 percent of the canopy cover would be reduced to 25 to 35 percent by commercial thinning. On 358 acres, 70 percent of the canopy cover would be reduced to 35 to 60 percent by commercial thinning.	N/A
Insects, Diseases, and Fires	Old-aged and diseased trees would be removed from 30 acres; 484 acres would have fewer insect-infested and disease-infected trees. The slash fire hazard would be short term.	The fire hazard would be very low on 30 acres after slash is treated. On 484 acres, the diameter growth would improve on the remaining trees; their resistance to insects and diseases would increase. Mortality risk from low- to moderate-intensity fires would be reduced.	18.4 percent of Swan River State Forest would be in a very low fire-hazard class (0-to-39-year age class). Fewer trees would be affected by insects and diseases.
Old Growth, as defined by *Green et al*	Due to road construction, 0.5 acre of the mixed-conifer old-growth cover type would be removed.	30 acres would no longer be available for consideration as future old growth. 484 acres of the 100-to-149-year age-class stands would develop large trees faster, which could become old growth in the future.	Due to road construction, 0.5 acre of the mixed-conifer old-growth cover type would be removed.
Fragmentation	Generally, patch size would not change since proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. Generally, the proposed commercial-thin harvesting would not change the patch size, age, or shape.	The seedtree harvest units that are located next to past harvest units and other proposed harvest units may result in bigger patches of the younger age class. Commercial-thin harvesting across several stands would tend to reduce the differences between stands and increase the patch size.	Seedtree harvesting would increase the amount of patches of the younger age class and move the forest toward historic conditions.

Direct, Indirect, and Cumulative Effects of Action Alternative F (Continued)

ATTRIBUTE MEASURED	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Noxious Weeds	Soil would be disturbed to provide seedbeds for weed seeds.	Weed seeds may be carried onto the site by vehicles and machinery related to harvesting.	All action alternatives, together with other State logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for weed seeds carried in by vehicles from off site.

WATERSHED AND HYDROLOGY ANALYSIS

INTRODUCTION

The environment pertaining to watershed and hydrology that would be affected by the proposed South Wood Timber Sale Project includes the Woodward Creek watershed and its tributaries. The analysis methods used to evaluate the existing conditions and assess the potential impacts to hydrology include a inventory of sediment sources, an assessment of the stability of the channels, and a computer modeling of the annual water yield.

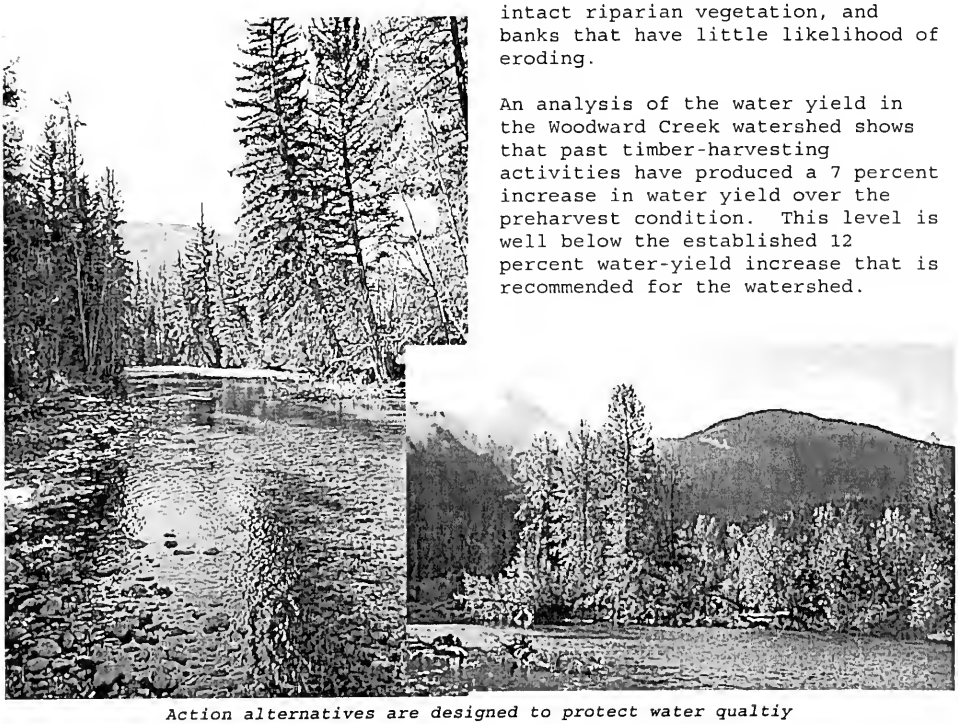
EXISTING CONDITION

According to a sediment-source inventory done on watersheds, the roads are not contributing much fine sediment to stream crossings despite the inadequate surface drainage at these stream-crossing sites. The surface drainage on the road system needs to be upgraded to meet current BMP standards.

Two wooden culverts are installed on perennial tributaries to South Woodward Creek. The 2 crossings are surfaced with road-fill material. The culverts are collapsing into the creek and are a sediment source to South Woodward Creek.

Channel-stability surveys show most reaches of Woodward Creek have good to excellent channel and bank conditions due to stable banks, intact riparian vegetation, and banks that have little likelihood of eroding.

An analysis of the water yield in the Woodward Creek watershed shows that past timber-harvesting activities have produced a 7 percent increase in water yield over the preharvest condition. This level is well below the established 12 percent water-yield increase that is recommended for the watershed.



Action alternatives are designed to protect water qualtiy

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A***

  No-Action Alternative A would have no direct effect to sediment delivery or water yield beyond those occurring under current management.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

  Each of the action alternatives would directly affect sediment delivery to Woodward Creek by:

  - removing a failing wooden bridge and restoring the site,
  - installing 2 culverts at stream crossings on a new road, and
  - replacing 8 culverts on a closed road.

  These sites would contribute sediment to Woodward Creek only while work is in progress. The amount of sediment would be minimized by applying BMP standards and erosion-control measures.

  These action alternatives would have no direct effect on water yield.

- ***Direct Effects Common to Action Alternatives C, D, E, and F***

  Each of these action alternatives would directly affect sediment delivery to Woodward Creek by replacing 4 culverts at stream crossings on South Woodward Road. These sites would contribute sediment to Woodward Creek only while work is in progress. The amount of sediment would be minimized by applying BMP standards and erosion-control measures.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

  This alternative would have no direct effect to sediment delivery or water yield beyond those currently occurring.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

  The action alternatives would indirectly affect sediment delivery to Woodward Creek in both the short and long term. The short-term risk of sediment delivery would increase due to bare soil being exposed by:

  - installing culverts on the open-road system,
  - constructing 0.5 miles of new road in Section 25,
  - replacing 8 culverts on a closed road, and
  - installing additional culverts on a closed road.

  Over the long term, the risk of sediment delivery would be reduced by improving surface drainage and erosion control on existing open and closed roads. Replacing the 8 culverts would reduce the long-term risk of sediment delivery by lowering the risk of stream-crossing failures. Removing a failing bridge and rehabilitating the site would reduce the risk of approximately 20 cubic yards of roadfill material washing into the creek.

- ***Indirect Effects Common to Action Alternatives C, D, E and F***

  Replacing 4 culverts on South Woodward Road would increase the short-term risk of sediment delivery by exposing bare soil. The long-term risk would be reduced by installing properly-designed culverts, which are less likely to fail.

- ***Indirect Effects of Action Alternative B***

  Skidding logs with ground-based machinery would increase the risk of sediment delivery by exposing bare soil on approximately 61 acres. Water yield would increase by approximately 0.3 percent over the existing condition.

- ***Indirect Effects of Action Alternative C***

  Skidding logs with ground-based machinery would increase the risk of sediment delivery by exposing bare soil on approximately 61 acres. The indirect risk of sediment delivery would increase from exposing bare soil on 2.3 miles of new road construction. Water yield would increase by approximately 0.5 percent over the existing condition.

- ***Indirect Effects of Action Alternative D***

  Skidding logs with ground-based machinery would increase the risk of sediment delivery by exposing bare soil on approximately 47 acres. The indirect risk of sediment delivery would increase from exposing bare soil on 4.9 miles of new road construction. Water yield would increase by approximately 0.6 percent over the existing condition.

- ***Indirect Effects of Action Alternative E***

  Skidding logs with ground-based machinery would increase the risk of sediment delivery by exposing bare soil on approximately 70 acres. The indirect risk of sediment delivery would increase from exposing bare soil on 4.3 miles of new road construction. Water yield would increase by approximately 0.5 percent over the existing condition.

- ***Indirect Effects of Action Alternative F***

  Skidding logs with ground-based machinery would increase the risk of sediment delivery by exposing bare soil on approximately 46 acres. The indirect risk of sediment delivery would increase from exposing bare soil on 2.3 miles of new road construction. Water yield would increase by approximately 0.4 percent over the existing condition.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No Action Alternative A***

  The cumulative effects of this alternative would be similar to those described in the existing conditions for water yield. In the long term, the stream crossings would continue to contribute sediment to the creek, and the failing wooden bridge would become a higher risk of failure and sediment delivery as it continues to age.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

  The cumulative effects of each of these action alternatives would increase the total sediment load to Woodward Creek over the existing conditions. Constructing roads, replacing culverts, and exposing bare soil by harvesting timber would generate a higher risk of sediment delivery. Improved erosion control on existing roads would lower sediment risk in the long term. None of the action alternatives would put the annual water yield in Woodward Creek over its recommended threshold. As a result of any of the proposed action alternatives, no adverse cumulative impacts to channel stability are expected due to increases in water yield.

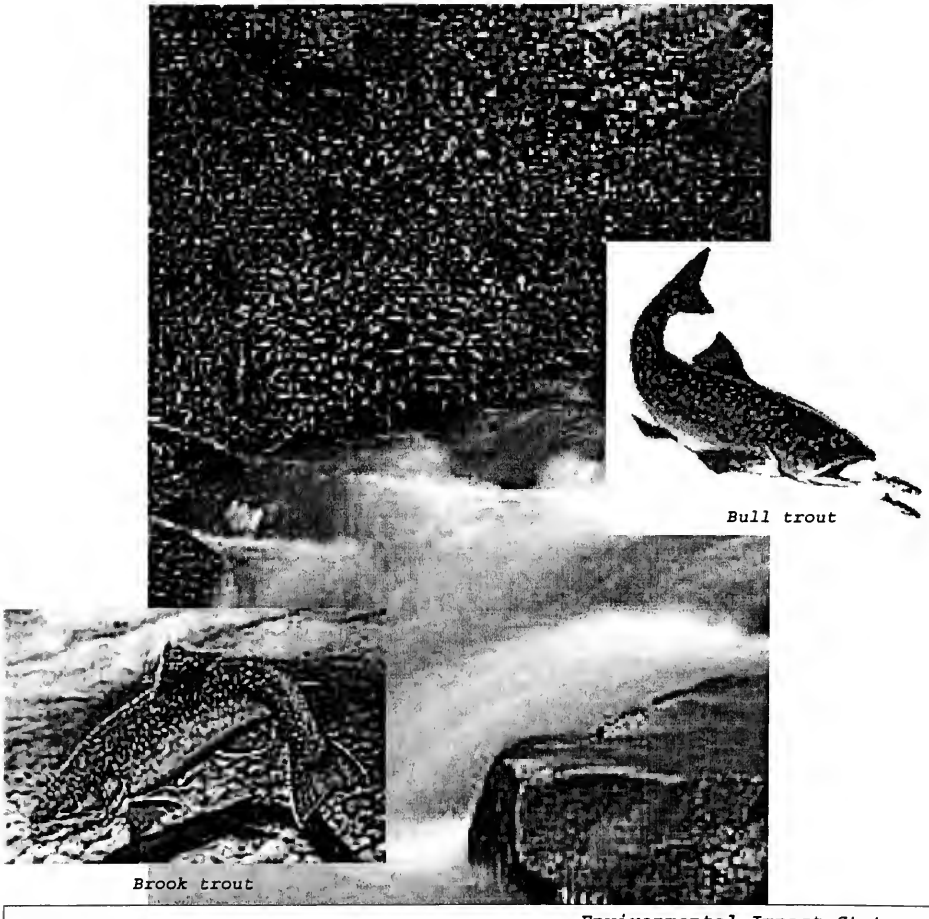
FISHERIES ANALYSIS

INTRODUCTION

Fish species that would be affected by this proposed project include brook trout, resident cutthroat trout, and bull trout. An analysis of the watershed and DFWP's monitoring of the fisheries habitat assessed the existing condition and impacts to these fish species. The Woodward Creek watershed was the area used to analyze these fish populations and their habitat.

EXISTING CONDITIONS

The current populations of bull trout are steady, and the streambed particle-size rating is in the acceptable range for both the South Woodward and Main Woodward watersheds. Management implications and commitments for threatened habitat are listed in the *Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Study*. No point sources of sediment were identified while inventorying the watershed, and all channels are stable.



Bull trout

Brook trout

FISHERIES ANALYSIS

DIRECT EFFECTS

- ***Direct Effects of No Action Alternative 1***

  This alternative would not directly affect fish populations in the Woodward Creek watershed.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

  Sediment delivered into the creek while replacing culverts may directly affect fish residing in the downstream waters. Measures to control erosion and applied BMPs would minimize that amount of sediment.

INDIRECT EFFECTS

- ***Indirect Effects of No Action Alternative 1***

  Fish populations would not be indirectly affected beyond what is now occurring.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

  While replacing culverts in each action alternative, sediment would be delivered to spawning reaches. Effects of this sediment may indirectly affect fish spawning nests. Completing the work after the emergence of fry and before spawning in the fall would eliminate the risk of adverse effects to the bull trout spawning beds. The action alternatives would also increase the risk of sediment delivery in the short term, but create a long-term reduction through improvements to the existing roads. Ground-based yarding in the harvest units would increase the risk of sediment delivery in the short term.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No Action Alternative 1***

  The cumulative effects would be similar to those described in the existing conditions. In the long term, bull trout populations may be adversely affected. Failed wooden stream crossings would continue to contribute sediment to the creek, and the failing wooden bridge on Main Woodward Creek would become a higher risk of failure and sediment delivery to spawning beds as it continues to age.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

  The risk of the action alternatives increasing the sediment loading would be low. The proposed alternatives would not affect the stability of the channels. Potential impacts to spawning habitat are short term and related to specific, one-time events. Proposed activities may adversely affect bull trout populations. This is due primarily to the sediment that would be generated by the rehabilitation of the bridge-removal site. Once the bridge removal and culvert replacements are completed, the habitat parameters would return to levels similar to those described under *EXISTING CONDITIONS*.

INTRODUCTION

Determining the effects of the proposed actions on all wildlife species within a project area is an impossible task. DNRC believes that if landscape patterns and processes are maintained, a full complement of wildlife species will exist across the landscape. DNRC also believes that certain species and their habitats should be evaluated to adequately estimate the effects to wildlife. Therefore, the methodologies used to portray the existing condition and determine wildlife impacts include determining the changes of forest structure and composition in general; evaluating the modification to habitats of specific species; and evaluating the level of human disturbance caused by, or resulting from, the project. The analysis areas vary in size by species.

EXISTING CONDITION

The existing forest structure and composition condition is displayed under *VEGETATION* in this chapter. This condition has changed since European settlement with both positive and negative effects to the different wildlife species.

Individual species analyzed:

Bald eagle – Classified as 'threatened' and protected under the Endangered Species Act. The project area is not within any known bald eagle breeding territory, but does contain some potential breeding habitat in the northeast portion of the project.

Canada lynx – Classified as 'threatened' and protected under the Endangered Species Act. Approximately 77 percent of the project area contains suitable habitat. Approximately 774 acres of lynx denning habitat were identified on DNRC lands in the project area. Foraging habitat is found throughout the project area. Numerous stands on DNRC and Plum Creek Timber Company lands were previously harvested using regeneration harvests. Many of these stands have well-established regeneration and provids habitat for snowshoe hares.

Grizzly bear – Classified as 'threatened' and protected under the Endangered Species Act. The project area varies from spring habitat in the big game winter range at low elevation, to meadows and cutting units that provide vegetative food sources during the summer, to alpine areas that provide habitat for denning and late summer and fall foraging.

The SVGBCA applies to this project. This grizzly bear subunit is open to harvesting during the nondenning period in the years 2000 through 2002. This agreement directs that:

- greater than 40 percent hiding cover must be maintained;
- no point of opening is allowed to be more than 600 feet from cover;
- at least 100 feet of visual screen must be left along open roads adjacent to regeneration harvest units; and
- less than 33 percent of each subunit must be maintained in open-road densities above 1 mile per square mile.

Northern Rocky Mountain wolf – Listed as 'endangered' and protected under the Endangered Species Act. The Northern Rocky Mountain Wolf Recovery Plan defines 3 recovery zones *(U.S. Fish and Wildlife Service [USFWS] 1987)*. The proposed project is in the Northwest Montana Recovery Zone. Wolves are not known to use the project area. The project area contains a small portion of winter range for white-tailed deer that may provide winter prey for wolves. The topography, access to water, and closeness of the big game winter range provide possible habitat for denning and/or rendezvous sites.

Boreal owl – Listed by DNRC as a 'sensitive' species. The project area contains 736 acres of DNRC lands that are identified as potentially providing habitat for boreal owls.

Fisher – Listed by DNRC as a 'sensitive' species. The project area contains an estimated 1,216 acres (19.2 percent) of DNRC lands that potentially provide preferred habitat and 2,307 (36.4 percent) that potentially provide suitable habitat. The DNRC parcels of land provide travel corridors for fishers. Recent regeneration harvests on Plum Creek Timber Company lands could possibly create barriers to fisher movement; however, the adjacent lands appear to provide adequate travel corridors to bypass harvested areas.

Trapping is a significant source of fisher mortality. Trapping pressure was responsible for the extirpation of fisher over most of their range by the 1930s. Although they now inhabit this area, populations remain vulnerable to trapping because traps set for marten, bobcats, and coyotes easily catch fishers.

Pileated woodpecker – These birds play an important role by excavating tree cavities that are used in later years by many other species of birds and mammals. Due to this important ecological role, the pileated woodpecker was listed on the sensitive species list of DNRC. Approximately 1,552 acres of potential habitat for pileated woodpeckers exist on DNRC lands scattered throughout the project area. Many other younger-aged stands within the project area may provide feeding or lower-quality nesting habitat.

White-tailed deer – The project area contains 385 acres of white-tailed deer winter range. This winter range extends east from the project area into a 36,384-acre winter range.

DIRECT EFFECTS

- ***Direct Effects of No Action Alternative A***

  No substantial changes in human disturbance or direct changes to habitat structure are expected under this alternative. Therefore, no direct effects to general wildlife species or the following species of concern are expected: bald eagle, Canada lynx, grizzly bear, Northern Rocky Mountain wolf, boreal owl, fisher, pileated woodpecker, and white-tailed deer.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

  No direct effects to the bald eagle, wolf, and boreal owl are expected under any action alternative. Negligible direct effects are expected to the lynx, fisher, and white-tailed deer.

  Should harvesting occur during the denning period of the grizzly bear, no direct effects are expected. Harvesting activites occurring during the nondenning period might present a minimal risk to grizzly bears, the risk increasing relatively with the increasing open-road densities. Individual pileated woodpeckers might be displaced, or some mortality might occur if nest trees are disturbed or cut if harvesting activities occur during nesting season (May through June). The effects to pileated woodpeckers are expected to be minor.

INDIRECT EFFECTS

- ***Indirect Effects Common to Alternatives A, B, C, D, E, and F***

  Reductions in hiding cover are expected to result in negligible effects to grizzly bears. Increased forage would be approximately proportional to canopy removal. The increased forage resulting from Action Alternative B would probably be offset by the proximity to open roads. The effects of all the action alternatives would be negligible.

  Under Alternatives A, B, C, D, and F, no boreal owl habitat would be altered, which would result in additional acres of habitat through time. Under Action Alternatives E, boreal owl habitat is not expected to change appreciably; therefore, the effects to the boreal owl are negligible. In the longer term, boreal owl habitat quality might increase under Action Alternatives C, D, E, and F.

  Under No-Action Alternative A and Action Alternative D and F, no big game winter range would be modified. Under Action Alternatives B, C, and E, timber harvesting is not expected to result in any measurable change in big game use or population in the area.

- ***Indirect Effects of No-Action Alternative A***

  In the long-term, species that use the more open stands and/or shade-intolerant tree species, such as many cavity-nesting species, would lose habitat, while species that use late successional and forest structure, such as pine marten, would benefit by an increase in habitat.

  Salvage operations and firewood cutting along open roads would continue, removing structure needed by bald eagles. This alternative would retain moderate-quality potential habitat in the short term, but habitat quality would decline in the future, resulting in a limited potential for increased eagle breeding territories in the area.

  The Canada lynx is not expected to be affected in the short term. Without disturbance, denning habitat would be expected to increase, but foraging opportunities would be expected to decrease, resulting in a reduced potential for lynx reproduction in the long term.

  Forest canopy closure would continue to decrease big game

forage in the area, thereby decreasing big game and potential wolf use of the area.

Fisher habitat would increase as shifts to shade-tolerant, older-aged stands continue.

Pileated woodpecker habitat would increase through time, then decline.

- ***Indirect Effects of Action Alternative B***

In the short-term, early successional species, such as mountain bluebirds, would benefit from these harvests. However, forest-dwelling species that rely on forested structure, such as pine martens, would lose habitat for a long period of time until these characteristics again developed in the stand. In the distant future, regeneration of shade-intolerant tree species would be available for cavity-nesting species.

Negligible indirect effects to the bald eagle, Canada lynx, and gray wolf would be expected.

This alternative might result in some shifting of fisher habitat, but would not increase mortality risk or create barriers to travel.

Timber removed would likely result in decreased pileated woodpecker reproduction in the area until trees regenerate to provide adequate canopy and midstory cover.

- ***Indirect Effects of Action Alternative C***

The effects of this alternative is similar to Action Alternative B, except the benefits for early successional species would not be realized, and the benefits expected in the long-term would occur in the short-term. Additionally, the trees remaining in the harvested stands are expected to increase their growth rate; thereby, the remaining trees would obtain larger sizes than under No-Action Alternative A.

Negligible indirect effects to the bald eagle, Canada lynx, gray wolf, and pileated woodpeckers would be expected.

Some reductions in the quality and quantity of fisher habitat are expected by this alternative, resulting in some shifts in habitat use. The effects of the new roads to fisher mortality are expected to be minimal.

- ***Indirect Effects of Action Alternative D***

The effects of this alternative is similar to Action Alternative B, except the benefits for early successional species would not be realized and the benefits expected in the long-term would occur in the short-term. Additionally, the trees remaining in the harvested stands are expected to increase their growth rate, thereby the remaining trees would obtain larger size than under No-Action Alternative A.

Salvage operations and firewood cutting along open roads would continue, removing structure needed by eagles. This alternative would retain moderate-quality potential habitat in the short-term, but habitat quality would decline in the future, resulting in limited potential for increased eagle breeding territories in the area.

The risk of mortality to Canada lynx and competition from other predators would increase due to road construction.

More of the preferred fisher habitat would be harvested than with Action Alternative C, resulting in more effects to fisher; the additional roads would increase the risk to fisher mortality.

No harvesting would occur in pileated woodpecker habitat. However, habitat for pileated woodpeckers is expected to develop in a shorter time frame.

- ***Indirect Effects of Action Alternative E***

This alternative combines the effects to age class and cover types of the other action alternatives.

Negligible indirect effects to the bald eagle would be expected.

This alternative would reduce lynx habitat the most and increase the risk of mortality/ competition due to roads similar to Action Alternative D.

Action Alternative E is expected to result in the shifting of fisher habitat due to the location of the harvest units. The additional roads would increase the risk to fisher mortality.

Action Alternative E would alter more habitat, but remove about the same amount of nesting habitat as Action Alternative C and produce more potential for salvaging timber in the future, resulting in decreased pileated woodpecker habitat.

- ***Indirect Effects of Action Alternative F***

No indirect effects to pileated woodpeckers, Canada lynx, or Northern Rocky Mountain wolves are expected in the short term. Fisher habitat might be altered, resulting in minor habitat shifts. The effects of the new roads to fisher mortality are expected to be minimal. In the longer term, commercial-thin harvesting might enhance pileated woodpecker, lynx denning, and fisher habitat by increasing the growth rate of the remaining trees.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A***

Habitat diversity in the area is expected to decrease in time, favoring species associated with late-succession, shade-tolerant habitats, such as pine marten, at the expense of species that rely on shade-intolerant tree species, such as many cavity-nesting species.

No portion of the old-growth network would be altered and the amount of late successional, dense old growth would be increased.

Pileated woodpecker habitat in and around the project area would increase through time, then decline.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

Efforts to convert stands to more adequately reflect the historic conditions outlined in *Losensky (1997)* would occur. These alternatives would benefit early successional species, such as mountain bluebirds, at the expense of mid- to late-successional species, such as hairy woodpeckers. In the distant future, the cover types and age classes would more closely reflect historic conditions.

The cumulative effects to bald eagles, wolves, grizzly bears, and big game would be negligible or minimal.

Since the project area is large enough to provide a home range for boreal owls, the effects discussed under direct effects would be the same for cumulative effects. In addition, continued salvage and heavy-removal harvests on adjacent Plum Creek Timber Company lands, especially in old growth, would reduce the amount of habitat available. Habitat conditions on USFS lands are expected to improve in time.

Salvage operations on DNRC lands decreased the quality of fisher habitat. Salvage and regeneration harvesting on adjacent Plum Creek Timber Company lands, especially in old growth, reduced the amount of habitat available. Habitat conditions on USFS lands are expected to improve in time. Under all alternatives, movement corridors from the project area into the cumulative effects area would be retained. The effects of the new roads discussed earlier would also apply to the cumulative effects area.

Potential pileated woodpecker nesting cover would be reduced. This loss would be additive to past and current harvests on Plum Creek Timber Company land and salvage operations on DNRC lands. Pileated woodpecker habitat in the analysis area would be reduced more under Action Alternative B than under Action Alternatives C, E, F, and D, respectively.

- ***Cumulative Effects Common to Action Alternatives C, D, and F***

  Under these alternatives, conversion from a mixed-conifer to a western larch/Douglas-fir cover type would move Swan River State Forest toward historic conditions. Action Alternative D converts 89 more acres than does Action Alternative C. Action Alternative F converts 92 more acres than does Action Alternative C. These conversions under Action Alternatives C and D would not alter the age-class distribution. Conversions under Action Alternative F would change 11 acres of the 100-to-149-year age class and 18 acres of the 150+-year age class to the 0-to-39-year age class. Action Alternatives C, D, and F are expected to benefit native wildlife species by reproducing habitats to which the species are adapted.

  Under Action Alternatives C and F, 5 stands (22-09, 16; 28-04, 10, 11) designated as "mature glue," respectively, would be commercially thinned. Under Action Alternative D, 6 stands (same as C and F, plus 22–08), designated as "mature glue," would be commercially thinned. This type of treatment is not expected to detract from the function of these stands, but might enhance their function by increasing the growth of residual trees.

  The cumulative effect of risk of lynx mortality or competition by other predators would be increased due to road construction.

- ***Cumulative Effects of Action Alternative B***

  Three stands (28-08, 11, 27) designated as "mature glue" would be regenerated. The seedtree harvests would reduce the interior habitat of the old-growth network, increase edge (amount and abruptness of habitat change), and reduce the connectivity of the network.

- ***Cumulative Effects of Action Alternative E***

  This alternative combines the effects of the other action alternatives.

  Five stands (14-13; 22-09, 16; 28-04, 11) designated as "mature glue" and 1 stand (22-17) designated as "recruitment old growth" would be commercially thinned. The effects would be similar to Action Alternatives C and D.

SOILS ANALYSIS

INTRODUCTION

Soil productivity could be affected by activities related to the project. The methodology used to portray the existing condition and determine the impacts to the productivity of the soil includes estimating the amount of soil that is compacted and displaced from roads, skid trails, and areas scarified to prepare the sites to grow new trees. The analysis area for soils includes the locations proposed for timber harvesting.

EXISTING CONDITIONS

Most of the areas proposed for harvesting have not been harvested in the past. Portions of the proposed project area have had salvage logging near roads. Where ground-based machinery was used for salvaging, trails are well spaced and not eroding. Soil types on the middle and upper slopes are well drained; harvesting activities would have an average season of use on these slopes. Some of the soil types in the lower areas near Woodward Meadows are wetland soils that seldom dry out and require special operating requirements. Up to 15 percent of the harvested areas may be compacted or displaced before productivity of the site is adversely impacted.

Cut and fill slopes that were grass seeded.

DIRECT EFFECTS

- ***Direct Effects of No Action Alternative A***

  This alternative would not directly affect soil productivity.

- ***Direct Effects of Action Alternative B***

  Approximately 53 acres (17 percent) of the proposed harvest units would be directly impacted by this alternative. In the long term, productivity of the soil on these sites would be maintained through BMPs and mitigation measures that are designed to lessen the impacts to soil productivity.

- ***Direct Effects of Action Alternative C***

  Approximately 6 acres (1 percent) of the proposed harvest units would be directly impacted by this alternative. In the long term, productivity of the soil on these sites would be maintained through BMPs and mitigation measures that are designed to lessen the impacts to soil productivity.

- ***Direct Effects of Action Alternative D***

  Approximately 5 acres (1 percent) of the proposed harvest units would be directly impacted by this alternative. The long term, productivity of the soil on these sites would be maintained through BMPs and mitigation measures that are designed to lessen the impacts to soil productivity.

- ***Direct Effects of Action Alternative E***

  Approximately 23 acres (4 percent) of the proposed harvest units would be directly impacted by this alternative. In the long term, productivity of the soil on these sites would be maintained through BMPs and mitigation measures that are designed to lessen the impacts to soil productivity.

- ***Direct Effects of Action Alternative F***

  Approximately 5 acres (1 percent) of the proposed harvest units would be directly impacted by this alternative. In the long term, productivity of the soil on these sites would be maintained though BMPs and mitigation measures that are designed to lessen the impacts to soil productivity.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

  This alternative would not indirectly affect soil productivity.

- ***Indirect Effects of Action Alternative B***

  Approximately 61 acres of the proposed harvest units would be in bare soil; risk of erosion would be higher on these acres. Tree growth and water infiltration would be reduced on the 53 acres of directly impacted soil generated by this alternative.

- ***Indirect Effects of Action Alternative C***

  Approximately 61 acres of the proposed harvest units would be in bare soil, which would increase the risk of erosion on these acres. Tree growth and water infiltration would be reduced on the 6 acres of directly impacted soil generated by this alternative.

- ***Indirect Effects of Action Alternative D***

  Approximately 47 acres of the proposed harvest units would be in bare soil, which would increase the risk of erosion on these acres. Tree growth and water infiltration would be reduced on the 5 acres of directly impacted soil generated by this alternative.

- ***Indirect Effects of Action Alternative E***

  Approximately 70 acres of the proposed harvest units would be in bare soil, which would increase the risk of erosion on these acres. Tree growth and water infiltration would be reduced on the 23 acres of directly impacted soil generated by this alternative.

- ***Indirect Effects of Action Alternative F***

  Approximately 46 acres of the proposed harvest units would be in bare soil, which would increase the risk of erosion on these acres. Tree growth and water infiltration would be reduced on the 5 acres of directly impacted soil generated by this alternative.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No Action Alternative A***

  This alternative would have no cumulative impacts on soil productivity.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

  Cumulative impacts to soil productivity in each of the proposed action alternatives would be avoided by using existing trails where stands have been salvaged in the past. In previously unharvested stands, the cumulative effects to soil productivity would be the same as the direct and indirect effects discussions.

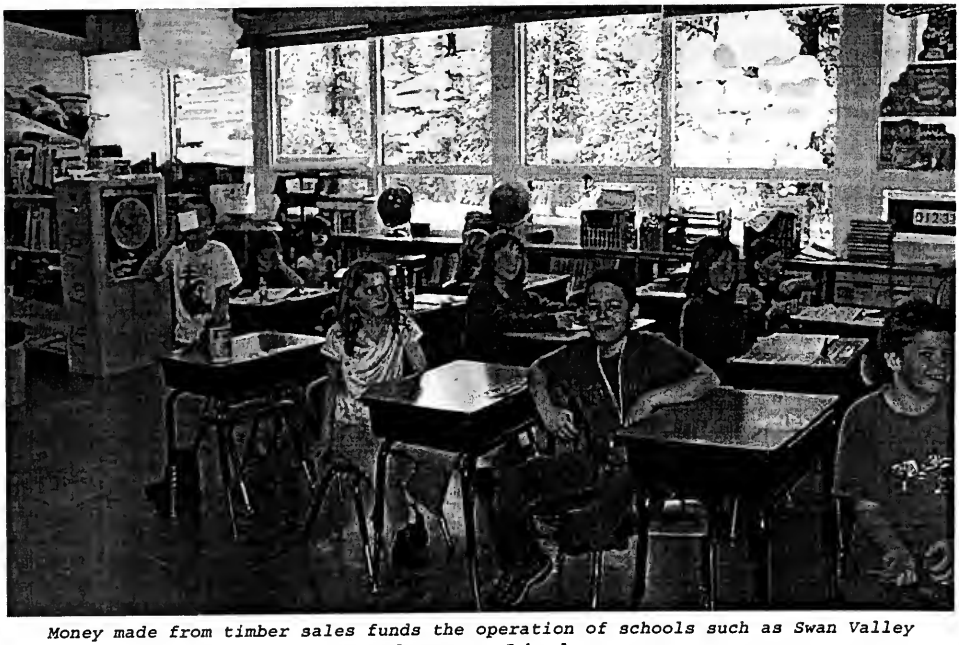
INTRODUCTION

This economic analysis estimates important consequences of adopting the various project alternatives considered in this document in terms of Montana public school finance. Each alternative was developed within environmental guidelines of the existing SFLMP; the economic analysis is designed to document the direct, indirect, and cumulative impacts on kindergarten through 12 public schools in Montana so that land managers and the public may be better able to make informed land-management judgments. Lands granted to Montana in statehood are managed to provide a legitimate return to the beneficiaries of the school trust. Each alternative considered in the document means that taxpayers and the legislature are faced with a different and unique set of school finance consequences.

EXISTING CONDITION

Expenditures for children attending kindergarten through grade 12 in public schools in Montana were estimated to be $5,869 per pupil in 1999, the most recent data available. Montana expenditures per pupil is below the national average.

Direct school income comes from a number of sources. DNRC manages natural resources to earn income for the school trust. The Montana Legislature adds revenue from the general fund. Local school districts also raise income through property taxes. The taxable value of property is an important factor that influences the ability of a local school district to generate tax revenue.



Money made from timber sales funds the operation of schools such as Swan Valley Elementary School.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A***

  No income would be provided for schools. General fund revenues would replace money that would not be generated by one of the action alternatives. The No-Action Alternative has the highest opportunity costs (foregone school revenue) because no money is generated for public schools.

- ***Direct Effects of Action Alternative B***

  Approximately $1,789,331 would be generated through this timber sale project. That is enough revenue to send 297 Montana children to public school for a year without any other financial support. Action Alternative B has the lowest opportunity costs since it produces the greatest revenue to the public schools.

- ***Direct Effects of Action Alternative C***

  Approximately $1,173,837 would be generated through this timber sale project. That is enough revenue to send 195 Montana children to public school for a year without any other financial support. Action Alternative C would have the third highest opportunity costs of the 6 alternatives.

- ***Direct Effects of Action Alternative D***

  Approximately $1,196,500 would be generated through this timber sale project. That is enough revenue to send 200 Montana children to public school for a year without any other financial support.

- ***Direct Effects of Action Alternative E***

  Approximately $1,310,948 would be generated from this timber sale project. That is enough revenue to send 218 Montana children to public school for a year without any other financial support.

- ***Direct Effects of Action Alternative F***

  Approximately $1,054,378 would be generated from this timber sale project. That is enough revenue to send 175 Montana children to public school for a year without any other financial support.

TABLE 2—PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED

	# JOBS	MONTANA INCOME TAX[1]	RESIDENTIAL PROPERTY TAX[2]	EQUIVALENT KINDERGARTEN-12 (K-12) STUDENTS[3]
Alternative A	0	0	0	0
Alternative B	64.3	$89,345	$43,740	22
Alternative C	56.8	$79,366	$38,340	20
Alternative D	56.2	$78,527	$37,935	19
Alternative E	61.2	$85,514	$41,310	21
Alternative F	47.5	$66,371	$32,063	16

[1]The income taxes are likely a conservative estimate as it is assumed that the wood products industry worker is the sole earner in the household. Estimates of taxes paid were made for workers in the seventh decile of earning in Montana based on data from Montana Department of Revenue, 2000.
[2]The estimate of the property taxes paid was made based on the total residential property taxes paid divided by the number of income tax filers in Montana; this relied on Montana Department of Revenue data.
[3]In calculating these K-12 equivalencies, it was assumed that all the property tax and income tax would go to the schools.

INDIRECT EFFECTS

State timber sales also indirectly support schools by providing jobs to people and businesses; income taxes raised from those jobs are deposited into the general fund. These business owners and workers, as well as many others who are directly or indirectly related to the timber industry, own land that is assessed for property taxes to support schools.

EMPLOYMENT AND EARNINGS IMPACT

ALTERNATIVE	JOBS SUPPLIED	TOTAL INCOME
A	0	0
B	64.3	$2,048,984
C	56.8	$1,809,989
D	56.2	$1,790,869
E	61.2	$1,950,199
F	47.5	1,513,635

The impacts on local communities are usually estimated by the number of jobs and the amount of income created by the harvesting and processing of timber products. The estimated employment in the forest industry in northwest Montana is 10.58 direct jobs per MMBF of timber harvested; and the annual income is $31,866 per job *(see TABLE 2—PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED)*.

The South Wood Timber Sale Project indirectly provides school revenue through property and income taxes generated by the jobs it creates. In ***TABLE 2—PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED,*** Action Alternatives B, C, D, E, and F estimate the school support generated by workers in the wood products industry as a result of both the income taxes and property taxes they can be expected to pay from anticipated income generated by each of the South Wood Timber Sale Project alternatives. Clearly, the workers will contribute to school support from their earnings.

CUMULATIVE EFFECTS

In this analysis, economic cumulative effects are tied to income earned by DNRC from timber management on State trust lands. The South Wood Timber Sale Project, if implemented, would provide a portion of the total income earned from those lands. In fiscal year (FY) 2000 (July 1, 1999 to June 30, 2000) DNRC earned a total income of $12,710,311 from forest-management activities. For every dollar DNRC spent in forest management, DNRC earned $2.78 in return. Therefore, the cost to implement the management program of DNRC was $4,572,054 in FY 2000; DNRC's net earnings for FY 2000 were $8,138,254. Earnings and costs change from year to year. The Statewide revenue-to-cost ratio for FY 1994 through FY 1999 was 2.68, 2.07, 1.68, 1.89, 1.72, and 1.36, respectively. These ratios may increase or decrease in the future, depending on the market conditions and the actual amount of timber bought and harvested. DNRC anticipates continuing to earn a profit from its forest-management program.

RECREATION

INTRODUCTION

The general public uses the project area for various recreational uses. The methodologies used to portray the existing condition and determine the impacts this project would have on recreation included determining the recreational uses, approximating the revenue received from recreational uses, and determining the potential for conflict between timber-harvesting activities and recreational uses. The analysis area includes all legally accessible State land within the project area and the roads that would be used to haul equipment and logs. The estimated dollars for comparing alternatives and making decisions may not reflect the actual returns or costs.

EXISTING CONDITION

The South Wood Timber Sale Project area receives recreational use throughout the year. The primary uses are berry picking, snowmobiling, bicycling, fishing, hiking, hunting, and camping. State lands are available for nonmotorized recreational use to anyone purchasing a General Recreational Use License for State Lands. Revenue from these licenses for the project area is approximately $1,184 per year. Swan River State Forest has one hunting outfitter license that includes the project area. The annual rental fee for this license is approximately $5,200.

DIRECT EFFECTS

- ***Direct Effects of the No Action Alternative 1***

  This alternative would not affect recreation.

- ***Direct Effects Common to Action Alternatives***

  Hunter success may be affected by disturbing normal game movement patterns with harvesting activities. Log hauling, snow plowing, and short delays during road construction may inconvenience snowmobilers, bicyclists, and other recreationalists. However, recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change with the implementation of this project.

INDIRECT EFFECTS

- ***Indirect Effects of the No Action Alternative 1***

  No change to the existing condition is anticipated.

- ***Indirect Effects Common to Action Alternatives***

  The amount of recreational use within the project area may change. Recreational users may use adjacent areas to avoid timber-harvesting and log-hauling activities. Recreational use and the income from outfitting and General Recreational Use Licenses are not expected to change as this project is implemented.

CUMULATIVE EFFECTS

- ***Cumulative Effects of the No Action Alternative 1***

  Some recreational users may be reluctant to use roads in the project area if the roads continue to deteriorate. However, recreational use and the income from General Recreational Use Licenses and outfitting are not expected to change.

- ***Cumulative Effects Common to Action Alternatives***

  The combined timber-harvesting and log-hauling activities of this project and Plum Creek Timber Company projects within the project area may move recreational use to adjacent areas outside of the project area. Existing recreational use on Swan River State Forest is expected to continue at the same level. Therefore, income from General Recreational Use Licenses and outfitting are not expected to change.

AIR-QUALITY ANALYSIS

INTRODUCTION

Air quality could be affected by the smoke created by burning slash produced from harvesting timber and road dust generated by project-related activities such as log hauling. The methodologies used to analyze how the air quality would be affected include estimating the location, amount, and timing of smoke and road dust. The analysis area for air quality includes all of Lake County, which is part of Montana Airshed 2, as defined by the Montana Airshed Group.

EXISTING CONDITION

Currently, the project area contributes very low levels of air pollution into the analysis area or local population centers. Temporary reductions to air quality currently exist in the summer and fall due to smoke generated from prescribed burns and dust produced by vehicles driving on dirt roads; neither affect local population centers beyond Environmental Protection Agency (EPA) standards. All burning activities comply with emission levels authorized by the Montana Airshed Group for all major burners in the analysis area. The project area is outside of any local impact zones where additional restrictions may be imposed to protect air quality.

Typical postharvest burning

DIRECT EFFECTS

- ***Direct Effects of No Action Alternative A***

  The existing condition would not change.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

  Postharvest burning would produce smoke emissions; log hauling and other project-related traffic on dirt roads would increase road dust during dry periods. None of the increases are expected to exceed standards or impact local population centers if burning is completed within the requirements imposed by the Montana Airshed Group and dust-abatement material is applied to roads during dry periods.

INDIRECT EFFECTS

- ***Indirect Effects of No Action Alternative A***

  The existing condition would not change.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

  Since emissions are expected to remain within the standards set for air quality, no indirect effects to human health at local population centers are anticipated.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No Action Alternative A***

  The existing condition would not change.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

  Additional smoke produced from prescribed burning on adjacent USFS, private, and State trust forest land would remain within the standards for air quality, but cumulative effects during peak burning periods could affect individuals with respiratory illnesses at local population centers for short durations. All known major burners operate under the requirements of the Montana Airshed Groups, which regulate the amount of emissions produced cumulatively by major burners.

AESTHETICS ANALYSIS

INTRODUCTION

The project area is generally seen by the public while sightseeing. The views of vegetation and topography that are next to roads or trails are known as foreground views. The views of hillsides or drainages from roads and trails are known as middleground views. The views of horizons, mountain ranges, or valleys are known as background views. The existing condition and the impacts to the current views are presented from the perspective of these 3 viewing categories. The foreground and middleground views are discussed in regard to changes in vegetation, soil, and timber stands along roads. Background views were analyzed based on the openness of the proposed harvest areas and the patterns of trees that would be left in those areas. The analysis areas for the foreground and middleground views are along the South Woodward, Main Woodward, Whitetail, Woodward Point, and Fatty Creek roads. The analysis area for background views is the northern Mission Range on the west side of Swan River State Forest, as viewed from Highway 83.

View of the project area

EXISTING CONDITION

Generally, foreground views along open roads are limited to 200 feet and contain views of open and dense forest stands and openings caused by past harvesting activities. Firewood gathering and salvage logging cause some damage to live trees; limbs and tops are left scattered along roads and ditches.

Middleground views are being able to see 200 to 1,000 feet from a road or trail and usually consist of hillsides or drainages. On State ownership, areas timber harvested in the past range in size from 10 to 150 acres and have a dense cover of 6- to 40-foot trees. Plum Creek Timber Company land has been heavily harvested by using widespread clearcut, seedtree, and selective harvests. Typically, these harvests have left openings of hundreds of acres. The harvest unit boundaries usually follow section lines and appear harsh and unnaturally straight.

Background views of the project area are a collection of drainages and ridges that make up a portion of the northern Mission Range. The vegetation is a mixture of dense mature forests and past harvest units. Past harvest units range from having few trees to dense retentions of mature trees and abundant tree regeneration.

DIRECT EFFECTS

- ***Direct Effects of No Action Alternative A***

  In the short term, shrubs and trees would continue to grow along the roads and limit views.

- ***Direct Effects of Action Alternative B***

  Action Alternative B would use a seedtree harvest method that would remove mature trees and retain 6 to 10 large trees per acre. Harvesting would aesthetically affect the harvest area by:

  - opening the view
  - damaging some vegetation;
  - creating logging slash;
  - disturbing soil along skid trails, in landings, and while constructing new roads; and
  - creating landing piles along roads in the project area.

  Foreground views would become the more-open middleground views. Except in areas where cable logging is used, a visual screen would be left along open roads. The harvest units of Action Alternative B are close to the valley floor and screened by existing timber walls; thus, they would not become background views from Highway 83.

- ***Direct Effects of Action Alternatives C and D***

  These action alternatives would use a harvest method that would remove some mature trees (commercial-thin). Harvesting would aesthetically affect the harvest area by:

  - causing some damage to vegetation;
  - creating logging slash;
  - disturbing soil along skid trails, landings, and while constructing new roads;
  - and creating landing piles along roads in the project area.

  Current foreground views would be altered and have fewer trees. However, in most cases, current foreground views would not change to allow for middleground views. A visual screen would be left along all open roads. Both alternatives are viewed as background from Highway 83. Harvested stands would have fewer trees and some small 1- to 2-acre openings.

- ***Direct Effects of Action Alternative E and F***

  These alternatives use both seedtree and commercial-thin harvest methods. Where seedtree harvesting is used, viewing effects would be similar to Action Alternative B. Where commercial-thin harvesting is used, viewing effects would be similar to Action Alternatives C and D. Action Alternative E and F have commercial-thin units that can only be viewed as background from Highway 83. These stands would have fewer trees and have small 1- to 2-acre openings in some areas.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

  Aesthetics would not be indirectly affected by this alternative.

- ***Indirect Effects of Action Alternative B, E, and F (Seedtree harvests)***

  The pattern of trees remaining and size of the area being treated would appear similar to the results of a moderately severe fire. Retention of some western red cedar, western white pine, and healthy nonmerchantable trees for screening would not be a result of this type of fire.

- ***Indirect Effects of Action Alternatives C, D, E, and F (Commercial-thin harvests)***

  The pattern of trees remaining would appear similar to the results of a low-intensity fire of mixed severity; though, in some cases the species retained may differ from the species that would survive a fire of this type.

CUMULATIVE EFFECTS

The following effects of other projects may occur in addition to the direct and indirect effects of this project:

- Natural processes on the landscape, such as wildfires, trees blown down, or insect infestations and disease infections, would continue to alter the view over time.
- In the short-term, effects to the view would be from present activities, such as firewood gathering and timber harvesting on adjacent Plum Creek Timber Company lands and DNRC ownership.
- Salvage harvesting and firewood gathering would alter foreground views by damaging vegetation along roads and leaving some debris on road surfaces and in ditches. The administration of salvage permits by DNRC would keep roadside debris at a minimum. Middleground and background viewing would remain unaltered.
- DNRC is planning other harvesting projects in the Whitetail area, which is located north of the project area. Alternatives have not yet been developed for the Whitetail project, but harvest units would probably affect viewing in the area.
- Harvesting will probably continue on adjacent Plum Creek Timber Company land. Openings will continue to grow and ownership lines will become more distinct.

IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF NATURAL RESOURCES

IRRETRIEVABLE

A resource that has been irretrievably committed is lost for a period of time. Many timber stands in the project area are mature; some individual trees are more than 150 years old. Any of the timber-harvesting alternatives would cause live trees to be irretrievably lost; they would no longer contribute to future snag recruitment, stand structure and compositional diversity, aesthetics, wildlife habitat, the nutrient-recycling process, or any other important ecosystem functions.

Areas converted from timber production to permanent roads would be lost from timber production and would not function as forested lands for a period of time.

IRREVERSIBLE

A resource that has been irreversibly committed cannot be reversed or replaced. The initial loss of trees due to timber harvesting would not be irreversible. Natural regeneration combined with site preparation and artificial regeneration would promote the establishment of new trees. If management decisions allowed for the continued growth of established trees, they would ultimately become equivalent in size to the irretrievably harvested trees.

Areas that are initially lost to timber production through road construction could, over time, be reclaimed and once again produce timber and function as forested land.

PREPARERS AND CONTRIBUTORS

SOUTH WOOD TIMBER SALE PROJECT

PREPARERS AND CONTRIBUTORS

DECISIONMAKER

Robert Sandman, for Stillwater/Swan State Forests (Unit Manager), DNRC, Swan River State Forest, 58741 Highway 83 South, Swan Lake, Montana 59911

ID TEAM MEMBERS

Gary Hadlock, Forest Engineering Specialist, DNRC, Northwestern Land Office, 2250 Highway 93 North, Kalispell, Montana 59901-2557

Dr. Dave Jackson, Forest Economist, University of Montana, Missoula, Montana 59802

Norm Merz, Wildlife Biologist, DNRC, Northwestern Land Office, 2250 Highway 93 North, Kalispell, Montana 59901-2557

Mike Mortimer, Legal Counsel, DNRC, Forest Management Bureau, 2705, Spurgin Road, Missoula, Montana 59801

Tony Nelson, Hydrologist, DNRC, Northwestern Land Office, 2250 Highway 93 North, Kalispell, Montana 59901-2557

Kathryn O'Connor, Forest Planner, DNRC, Forest Management Bureau, 2705, Spurgin Road, Missoula, Montana 59801

Dan Roberson, Forest Management Specialist/Project Leader, DNRC, Swan River State Forest, 58741 Highway 83 South, Swan Lake, Montana 59911

Allen Wolf, Trust Lands Professional, DNRC, Northwestern Land Office, 2250 Highway 93 North, Kalispell, Montana 59901-2557

TECHNICAL SUPPORT AND ASSISTANCE

Margaret Beck, Graphics and Publication Technician, DNRC, Stillwater State Forest, PO Box 164, Olney, Montana 59927.

Karen Goode, Management Forester, DNRC, Swan River State Forest, 58741 Highway 83 South, Swan Lake, Montana 59911

Wanemah Hulett, Graphics and Publication Technician, DNRC, Swan River State Forest, 58741 Highway 83 South, Swan Lake, Montana 59911

Robert Lionberger, Management Forester, Clearwater State Forest, DNRC, P.O. Box 388, Greenough, Montana 59836

Paul McKenzie, Special Uses Forester, DNRC, Stillwater State Forest, P.O. Box 164, Olney, Montana 59927.

Michael McMahon, Management Forester, DNRC, Stillwater State Forest, P.O. Box 164, Olney, Montana 59927.

Bill Schultz, State Land Management Supervisor, DNRC, Forest Management Bureau, 2705 Spurgin Road, Missoula, Montana 59801

REFERENCES

SOUTH WOOD TIMBER SALE PROJECT

REFERENCES

Ake, K. 1994. *Protocol Paper: Moving Window Motorized Access Density Analysis and Security Core Area Analysis for Grizzly Bear.* Unpubl. mimeo., 2/22/1995. Flathead National Forest, Kalispell, MT. 10pp.

Aney, W. and R. McClelland. 1985. *Pileated Woodpecker Habitat Relationships (revised).* Pages 10-17 *In* Warren, N. eds. 1990. Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains. USFS, Northern Region, Wildlife Habitat Relationships Program R1-90-42. 47pp.

Apps, C.D. 2000. *Space-Use, Diet, Demographics, and Topographic Associations of Lynx in the Southern Canadian Rocky Mountains: A Study.* Chapter 12 *In* Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. Univ. Press of CO, Boulder, CO. 480pp.

Baty, Ross. February 18, 2000. Consideration for Prioritization of Old-Growth Stands for Networks and Deferred Areas. DNRC Internal Report.

Beer, Margaret. July 2000. Species of Special Concern: Plant Species and Other Features of Special Concern: Swan River State Forest and Vicinity. Montana Natural Heritage Program. Unpublished report to DNRC.

Bosch, J.M., and J.D. Hewlett. 1982. A Review of Catchment Experiments to Determine the Effect of Vegetation Changes on Water Yield and Evaportranspiration. J. Hydrology, 55:3-23.

Bell, . 1988. Log Scaling and timber Cruising. Pp 264 ff. Oregon State University.

Bull, E., T. Torgersen, A. Blumton, C. McKenzie, and D. Wyland. 1995. Treatment of an Old-Growth Stand and Its Effects on Birds, Ants, and Large Woody Debris: A Case Study. USDA For. Serv.. Gen. Tech. Rep. PNW-GTR-353. 12pp.

Bull, E. per. comm. Research Scientist. USDA For. Serv., Pacific Northwest Res. Sta.

Buskirk et al. 2000 Apps, *Habitat Fragmentation and Interspecific Competition: Implications for Lynx Conservation.* Chapter 4 *In* Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. Univ. Press of CO, Boulder, CO. 480pp.

DNRC. 1990, 1992, 1994, 1996, 1998, 2000. Montana Forestry Best Management Practices Monitoring. Forestry BMP Audit Reports. Forestry Division. Missoula, MT.

DNRC. 1996. State Forest Land Management Plan. Montana Department of Natural Resources and Conservation, Missoula, MT.

DSL, IDL, USFS. 1996. Forest Insect and Disease Identification and Management.

Filip, Gregory, et al. 1983. Recognizing and Reducing Hazard in Advanced Grand and White Fir Regeneration in Eastern Oregon and Washington. USDA, Forest Service. 18 pp.

Fisher, W.C., A.F. Bradley. 1987. Fire Ecology of Western Montana Forest Habitat Types. USFS Gen. Tech. Rept. INT-223.

Flathead Basin Commission. 1991. Flathead Basin Forest Practices, Water Quality, and Fisheries Cooperative Program, Final Report, Kalispell, MT.

FNF. 2000. *Potential Lynx Habitat and Analysis Units (map and protocol)*. FNF, Kalispell, MT.

Flowers, Pat. 12/5/94. Immediate Actions for Bull Trout Restoration. DNRC. Missoula, MT 5 pp.

Gardner, B. 2000. Baseline Condition for Bull Trout *(Salvelinus confluentus). Swan River Drainage, Including Disjunct Populations of Holland Lake and Lindbergh Lake*. FNF, Swan Lake Ranger District. Unpublished report. Pp 32-35.

Gilbert, B., A. Vanderhey, V. LaFountain, R. Baty. 2000. *1999 Swan Valley Conservation Agreement Monitoring Report*. Plum Creek Timber Company, Columbia Falls, MT. 9pp.

Green et.al. 1992. Old-Growth Forest Types of the Northern Region. R-1, Northern Region, Missoula, MT, USDA Forest Service. 60pp.

Haupt, H.F., et al. 1974. Forest Gydrology Part II: Hydrologic Effects of Vegetation Manipulation. USDA Forest Service, Region 1. Missoula, MT.

Hayward, G.D. 1994. *Review of technical knowledge: Boreal owls.* Pages 89-121 *in* Hayward, G.D and J. Verner, eds., Flammulated, Boreal and Great Gray Owls in the United States: A Technical Conservation Assessment. USDA For. Serv. GTR RM-253.

Heinemeyer, K and J. Jones. 1994. Fisher Biology and Management in the Western United States: A Literature Review and Adaptive Management Strategy. USDA For. Serv. Northern Region, Missoula, MT. 108pp.

Heinemeyer, K.S. 1993. Temporal Dynamics in the Movements, Habitat Use, Activity, and Spacing of Reintroduced Fishers in Northwest Montana. M.S. Thesis, Univ. Montana, Missoula, MT. 158pp.

Heinemeyer, unpubl. As cited in Heinemeyer, K and J. Jones. 1994. Fisher Biology and Management in the Western United States: A Literature Review and Adaptive Management Strategy. USDA For. Serv. Northern Region, Missoula, MT. 108 pp.

IGBC. 1998. Grizzly Bear/Motorized Access Management. Interagency Grizzly Bear Committee. 6pp.

Jackson, David H., and Charles Keegan. 2001. Timber Harvesting, Growth and Residential Real Estate Value: Myths Versus Reality. Draft publication. University of Montana, School of Forestry, Missoula, MT. 8 pp.

Johnson, S. 1984. Home Range, Movements, and Habitat Use of Fishers in Wisconsin. M.S. Thesis, Univ. Wisconsin, Stevens Point. 78pp.

Jones, J.L. 1991. Habitat Use of Fisher in Northcentral Idaho. M.S. Thesis, Univ. Idaho, Moscow, ID. 147pp.

Joslin, P. 1967. Movements and Home Sites of Timber Wolves in Algonquin Park. Amer. Zool. 7:279-88.

Koehler, G. and J. Brittell. 1990. Managing Spruce-Fir Habitat for Lynx and Snowshoe Hares. J. For. 88:10-14.

Koehler, G.M. 1990. Population and Habitat Characteristics of Lynx and Snowshoe Hares in North Central Washington. Can. J. Zool. 68:845-851.

LaFountain, V. pers. comm. Wildlife Biologist, Swan Lake Range District, Flathead National Forest.

Leathe, Stephen A. 1985. Cumulative Effects of MicroHydro Development on the Fisheries of the Swan River Drainage, Montana. DFWP. Unpublished report.

Losensky, B.J. 1997. Historical Vegetation in Region One by Climatic Section - Draft Report, Revision Three. USDA Forest Service, Northern Region, Missoula, MT.

Losensky, B.J. 1997. Historical Vegetation of Montana. Unpublished report done under contract for Montana Department of Natural Resources and Conservation, Missoula, MT.

Mace, R and J. Waller. 1997. *Spatial and Temporal Interactions of Male and Female Grizzly Bears in Northwest Montana*. Pages 44-59 *In* Mace, R and J. Waller. Final Report: Grizzly Bear Ecology in the Swan Mountains, Montana. Fish, Wildlife and Parks, Reg. 1. Kalispell, MT. 191pp.

Mace, R., J. Waller, T. Manley, L. Lyon, H. Zuuring. 1997. *Relationships Among Grizzly Bears, Roads, and Habitat in the Swan Mountains, Montana*. Pages 64-73 *In* Mace, R.D and J.S. Waller. 1997. Final Report: Grizzly Bear Ecology in the Swan Mountains. Montana Fish, Wildlife and Parks, 1920 6th Ave. East. P.O. Box 200701, Helena, MT 59620-0701.

Marten, P. 1979. Productivity and Taxonomy of the *Vaccinium Globulare, V. Membranaceum* Complex in Western Montana. M.S. Thesis. Univ. of Montana, Missoula. 136pp.

Martinson, A., and W. Basko. 1983. A Soil Resource Inventory and Analysis for Land-Use Planning and Resource Allocation. USDA Forest Service, Flathead National Forest, Kalispell, MT.

McClelland, R. and P. McCelland. 1999. *Pileated Woodpecker Nest and Roost Trees in Montana: Links with Old-Growth and Forest "Health"*. Wildlife Soc. Bull. 27(3): 846-857.

Montana Bald Eagle Working Group. 1991. Habitat Management Guide For Bald Eagles in Northwestern Montana.

Montana Bald Eagle Working Group. 1994. Montana Bald Eagle Management Plan. USDI Bureau of Land Management. Billings, MT. 61pp.

Montana Bull Trout Restoration Team. 2000. Restoration Plan for Bull Trout in the Clark Fork and Kootenai River Basins. Montana Department of Fish, Wildlife and Parks.

Muhlfeld, John. 1998. Preliminary Assessment: Woodward Creek Watershed: Swan Unit Upland and In-Channel Sediment Source Inventory. NWLO. DNRC. 9 pp.

Old-Growth Management on Montana State Trust Lands, August 7, 2000. SFLMP. DNRC Supplemental Biodiversity Guidance. Internal report.

Overton, C.K., et al. 1997. R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. Intermountain Research Station, INT-GTR-346.

Pearson, D. 1999. Small Mammals of the Bitterroot National Forest: A Literature Review and Annotated Bibliography. USDA For. Serv. Gen. Tech. Rep. RMRS-GTR-25.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest Habitat Types of Montana. USDA, Forest Service Gen. Tech. Rpt. INT-34.

Pierce, John, and Drake Barton. Sensitive Plant Survey in the Swan River State Forest Montana. Unpublished report to DNRC. September, 2000.

Powell, R. 1982. The Fisher: National History, Ecology, and Behavior. Univ. Minn. Press, Minneapolis. 217pp.

Power, Thomas M. September 1996. Montana State Forests, Schools, and Quality of Life: An Economic Analysis. A study prepared for FOWS. 45 pp.

Roy, K. 1991. Ecology of Reintroduced Fishers in the Cabinet Mountains of Northwest Montana. M. S. Thesis, Univ. Mont., Missoula. 94pp.

Ruediger, B, J Claar, Sl Mighton, B. Nanaey, T. Tinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, S. Gniadek. 2000. Canada Lynx Conservation Assessment and Strategy (2nd Edition). USDA For. Serv., USDI Fish and Wildlife Serv., USDI Bureau of Land Management, and USDI National Park Serv. Missoula, MT. 122pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. Univ. Press of CO, Boulder, CO. 480pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al. 2000a. *The Scientific Basis for Lynx Conservation: Qualified Insights.* Chapter 16 *In* Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. Univ. Press of CO, Boulder, CO. 480pp.

SFLMP Biodiversity Implementation Guidance. May 15, 1998. DNRC Internal Guidance.

Squires, J. and T. Laurion. 2000. *Lynx Home Range and Movements in Montana and Wyoming: Preliminary Results.* Chapter 11 *In* Ruggiero, L. F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. Univ. Press of CO, Boulder, CO. 480pp.

University of Montana. Bureau of Business and Economic Research. 2000. Montana Sawlog and Veneer Log Price Report.

USDA Forest Service. 1998. Watershed Condition-Rating Standards for. From KNF-2670-BT1 through BT5. Kootenai National Forest.

USFWS 1987. Northern Rocky Mountain Wolf Recovery Plan. USFWS, Denver, CO. 119pp.

USFWS. 1986. Recovery Plan for the Pacific Bald Eagle. USFWS. Portland, OR. 160pp.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula, MT. 181pp.

USFWS. 1999. Rocky Mountain Wolf Recovery: 1999 Annual Report. USFWS. Helena, MT. 22pp.

Wicker, Ed, and C.D. Leaphart. 1974. *Fire and Dwarf Mistletoe Relationships in the Northern Rocky Mountains*. USDA, Forest Service. Proceeding Tall Timbers Fire Ecology Conference and Fire and Land Management Symposium. Pp 279-297.

Wright, M. and R. Escano. 1986. Montana Bald Eagle Nesting Habitat: A Macro-Habitat Description. USDA For. Serv. Wildlife and Fish Habitat Relationships Program. Missoula, MT. 24pp.

GLOSSARY

SOUTH WOOD TIMBER SALE PROJECT

GLOSSARY

Acre-foot
A measure of water or sediment volume equal to an amount of material that would cover 1 acre to a depth of 1 foot.

Action alternative
One of several ways of moving toward the project objectives.

Administrative road use
Road use that is restricted to DNRC personnel and contractors for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

Airshed
An area defined by a certain set of air conditions; typically a mountain valley where air movement is constrained by natural conditions such as topography.

Appropriate conditions
Describes the set of forest conditions determined by DNRC to best meet the SFLMP objectives. The 4 main components useful for describing an appropriate mix of conditions are cover-type proportions, age-class distributions, stand-structure characteristics, and the spatial relationships of stands (size, shape, location, etc.); all are assessed across the landscape.

Background view
Views of distant horizons, mountain ranges, or valleys from roads or trails.

Basal area
A measure of the number of square feet of space occupied by the stem of a tree taken at 4.5 feet above the ground.

Best Management Practices (BMPs)
Guidelines to direct forest activities, such as logging and road construction, for the protection of soils and water quality.

Biodiversity
The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems where they occur.

Board foot
144 cubic inches of wood that is equivalent to a piece of lumber 1-inch thick by 1 foot wide by 1 foot long.

Canopy
The upper level of a forest consisting of branches and leaves of the taller trees.

Canopy closure
The percentage of a given area covered by the crowns, or canopies, of trees.

Cavity
A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

Commercial-thin harvesting
A harvest that cuts a portion of the merchantable trees within a stand to provide growing space for the trees that are retained. For the South Wood Timber Sale Project, thinning would reduce stand densities to approximately 100 trees per acre.

Compaction
The increase in soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

Connectivity
The quality, extent, or state of being joined; unity; the opposite of fragmentation.

Core area
See Security Habitat (grizzly bears).

Cover
See HIDING COVER and/or THERMAL COVER.

Co-dominant tree
A tree that extends its crown into the canopy, receiving direct sunlight from above and limited sunlight on its sides. One or more sides are crowded by the crowns of other trees.

Coarse down woody material
Dead trees within a forest stand that have fallen and begun decomposing on the forest floor.

Crown cover or crown closure
The percentage of a given area covered by the crowns of trees.

Cull
A tree of such poor quality that it has no merchantable value in terms of the product being cut and manufactured.

Cutting or harvest units
Areas of timber proposed for harvesting.

Cumulative effect
The impact on the environment that results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor actions, but collectively they may compound the effect of the actions.

Direct effect
Effects on the environment that occur at the same time and place as the initial cause or action.

Discounting
In economics, a method of accounting for the value of money over time, its ability to earn interest, so that costs and benefits occurring at different points in time are brought to a common date for comparison.

Ditch relief
A method of draining water from roads using ditches and a corrugated metal pipe. The pipe is placed just under the road surface.

Dominant tree
Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

Drain dip
A graded depression built into a road to divert water and prevent soil erosion.

Ecosystem
An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

Environmental effects
The impacts or effects of a project on the natural and human environment.

Equivalent clearcut area (ECA)
The total area within a watershed where timber has been harvested, including clearcuts, partial cuts, roads, and burns.

Allowable ECA - The estimated number of acres that can be clearcut before stream-channel stability is affected.

Existing ECA - The number of acres that have been previously harvested taking into account the degree of hydrologic recovery that has occurred due to revegetation.

Remaining ECA -The calculated amount of harvesting that may occur without substantially increasing the risk of causing detrimental effects to stream-channel stability.

Excavator piling
The piling of logging residue (slash) using an excavator.

Fire regimes
Describes the frequency, type, and severity of wildfires. Examples include: frequent, nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

Forage
All browse and nonwoody plants available to wildlife for grazing.

Foreground view
The view immediately adjacent to a road or trail.

Forest improvement (FI)
The establishment and growing of trees after a site has been harvested. Associated activities:

- site preparation, planting, survival checks, regeneration surveys, and stand thinnings;
- road maintenance;
- resource monitoring;
- noxious weed management; and
- right-of-way acquisition on a State forest.

Fragmentation (forest)
A reduction of connectivity and an increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural characteristics are interrupted through disturbances, such as stand-replacement fires and timber stand harvesting.

Habitat
The place where a plant or animal naturally or normally lives and grows.

Habitat type
Land areas that would produce similar plant communities if left undisturbed for a long period of time.

Hazard reduction
The abatement of a fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

Hiding cover
Vegetation capable of hiding 90 percent of a standing adult mammal from human view at a distance of 200 feet.

Historical forest condition
The condition of the forest prior to settlement by Europeans.

Implicit Gross Domestic Product (GDP) Deflator
A measure of changes in the purchasing power of money in the U.S. economy. It is different from the

Indirect effects
Secondary effects that occur in locations other than the initial action or significantly later in time.

Intermediate trees
Characteristics of certain tree species that allow them to survive in relatively low-light conditions, although they may not thrive.

Interdisciplinary team (ID Team)
A team of resource specialists brought together to analyze the effects of a project on the environment.

Landscape
An area of land with interacting ecosystems.

Mature glue
Mature stands that are not old growth, but have been identified as important in maintaining forest canopy connectivity within Swan River State Forest's Old-Growth Network.

Middleground view
The view that is 200 to 1,000 feet from a road or trail, usually consisting of hillsides and drainages.

Mitigation measure
An action or policy designed to reduce or prevent detrimental effects.

Moving-window analysis
A computer-based method that, in this EIS, is used to quantify the area influenced by roads in a study area. Starting with the pixel in the upper left corner of the computerized subunit map, the computer calculates how many miles of road exist within a 1-square-mile "window" around that pixel. It moves to the next pixel and repeats the process until the road density is calculated in a 1-square-mile area around every pixel in the study area. The number and percentage of pixels in the study area that fall into different road density classes are then calculated by the computer.
Based on research studying the effects of roads on grizzly bears, the effects of open roads are measured by the percentage of the pixels in the study area that have at least 1.0 mile of open road in the surrounding 1-square-mile window. The effects of total roads (open, gated, barricaded, bermed, but not brushed, etc.) are measured by the percentage of pixels in the study area that have at least 2 miles of open or restricted roads in the surrounding 1-square-mile window.

Multistoried stands
Timber stands with 2 or more distinct stories.

Nest site area (bald eagle)
The area in which human activity or development may stimulate the abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. It is either mapped for a specific nest, based on field data, or, if that is impossible, is defined as the area within a ¼-mile radius of all nest sites in the breeding area that have been active within the past 5 years.

No-action alternative
The option of maintaining the status quo and continuing present management activities by not implementing the proposed project.

Nonforested area
A naturally occurring area, (such as a bog, natural meadow, avalanche chute, and alpine areas) where trees do not establish over the long term.

Old growth
Working definition - Old growth as defined by *Green et al.*

Conceptual definition - The term old growth is sometimes used to describe the later, or older, stages of natural development of forest stands. Characteristics associated with old-growth generally include relatively large old trees that contain a wide variation in tree sizes, exhibit some degree of a multi-storied structure, have signs of decadence, such as rot and spike-topped structure, and contain standing large snags and large down logs.

Old-growth network
A collection of timber stands that are selected to meet a management strategy that would retain and recruit 150+-year-old stands over the long term (biodiversity, wildlife, the spatial arrangement of stands and their relationship to landscape patterns and processes) are elements that are considered in the selection of stands.

Overstory
The level of the forest canopy that include the crowns of dominant, codominant, and intermediate trees.

Patch
A discrete (individually distinct) area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

Potential nesting habitat (bald eagle)
Sometimes referred to as 'suitable nesting habitat', areas that have no history of occupancy by breeding bald eagles, but contain potential to do so.

Project file
A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the South Wood Timber Sale Project EIS is located at the Swan River State Forest headquarters office at Goat Creek.

Redds
The spawning ground or nest of various fish species.

Regeneration
The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

Relict
A scientific term used when talking about trees left over from fires, residual soil or geologic features, etc.; something that has survived destructive processes.

Residual stand
Trees that remain standing following any cutting operation.

Road-construction activities
In general, "road-construction activities" refers to all activities conducted while building new roads, reconstructing existing roads, and obliterating roads. These activities may include any or all of the following:

- constructing road
- clearing right-of-way
- excavating cut/fill material
- installing road surface and ditch drainage features
- installing culverts at stream crossings
- burning right-of-way slash
- hauling and installing borrow material
- blading and shaping road surfaces

Road improvements
Construction projects on an existing road to improve the ease of travel, safety, drainage, and water quality.

Saplings
Trees 1.0 inches to 4.0 inches in dbh.

Sawtimber trees
Trees with a minimum dbh of 9 inches.

Scarification
The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

Scoping
The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed and the depth of the assessment that will be required. It also includes a review of other factors such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

Security
For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.
Security habitat (grizzly bears)
An area of a minimum of 2,500 acres that is at least 0.3 miles from trails or roads with motorized travel and high-intensity, nonmotorized use during the nondenning period.

Seedlings
Live trees less than 1.0 inch dbh.

Seedtree harvesting
Removes all trees from a stand except for 6 to 10 seed-bearing trees per acre that are retained to provide a seed source for stand regeneration.

Seedtree harvesting with group retention
Same as seedtree harvesting with the additional retention of scattered clumps of young, healthy understory trees and clumps of western red cedar with full crowns.

Sediment
Solid material, mineral or organic, that is suspended and transported or deposited in bodies of water.

Sediment yield
The amount of sediment that is carried to streams.

Seral
Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

Shade intolerant
Describes tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Swan River State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

Shade tolerant
Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Swan River State Forest, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, western hemlock, and western red cedar.

Sight distance
The distance at which 90 percent of an animal is hidden from view by vegetation.

Silviculture
The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

Site Preparation
A hand or mechanized manipulation of a harvested site to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation to create microclimate conditions conducive to the establishment and growth of desired species.

Slash
Branches, tops, and cull trees left on the ground following harvesting.

Snag
A standing dead tree or the portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.

Snow intercept
The action of trees and other plants in catching falling snow and preventing it from reaching the ground.

Spur roads
Low-standard roads that are constructed to meet minimum requirements for harvesting-related traffic.

Stand
An aggregation of trees that are sufficiently uniform in composition, age, arrangement, and condition and occupy a specific area that is distinguishable from the adjoining forest.

Stand density
Number of trees per acre.

Stocking
The area of a piece of land that is now covered by trees is compared to what could ideally grow on that same area. The comparison is usually expressed as a percent.

Stream gradient
The slope of a stream along its course, usually expressed in percentage, indicating the amount of drop per 100 feet.

Stumpage
The value of standing trees in the forest. Sometimes used to mean the commercial value of standing trees.

Substrate scoring
Rating of streambed particle sizes.

Succession
The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

Suppressed
The condition of a tree characterized by a low-growth rate and low vigor due to overcrowding competition with overtopping trees.

Texture
A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

Thermal cover
For white-tailed deer, thermal cover has 70 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller. For elk and mule deer, thermal cover has 50 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

Timber-harvesting activities
In general, all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling standing trees and bucking them into logs
- skidding logs to a landing
- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarifying, preparing the site as a seedbed
- planting trees

Transaction Evidence Equation
Multivariant regression based on past sales and market variables.

Understory
The trees and other woody species growing under a, more-or-less, continuous cover of branches and foliage formed collectively by the overstory of adjacent trees and other woody growth.

Uneven-aged stand
Various ages and sizes of trees growing together on a uniform site.

Ungulates
Hoofed mammals, such as mule deer, white-tailed deer, elk, and moose, that are mostly herbivorous and many are horned or antlered.

Vigor
The degree of health and growth of a tree or stand.

Visual screening
The vegetation that obscures or reduces the length of view of an animal.

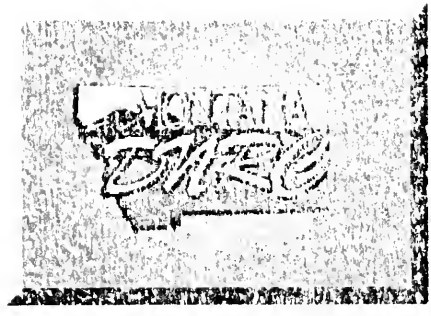
Watershed
The region or area drained by a river or other body of water.

Water yield
The average annual runoff for a particular watershed expressed in acre-feet.

Water yield increase
An increase in average annual runoff over natural conditions due to forest canopy removal.

Windthrow
A tree pushed over by wind. Windthrows (blowdowns) are common among shallow-rooted species and in areas where cutting or natural disturbances have reduced the density of a stand so individual trees remain unprotected from the force of the wind.

Copies of this document with its appendices were published at an approximate cost of $14.00 per copy, for printing and $5.50 for mailing.



DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
SWAN UNIT OFFICE - SWAN RIVER STATE FOREST
58741 HIGHWAY 83 SOUTH
SWAN LAKE, MT 59911
(406) 754-2301

Persons with disabilities who need an alternative, accessible Format of this document should contact DNRC At the address or phone number shown above.